# To the American People:

"Your sons, husbands and brothers who are standing today upon the battlefronts are fighting for more than victory in war. They are fighting for a new world of freedom and peace.

"We, upon whom has been placed the responsibility of leading the American forces, appeal to you with all possible earnestness to invest in War Bonds to the fullest extent of your capacity.

"Give us not only the needed implements of war, but the assurance and backing of a united people, so necessary to hasten the victory and speed the return of your fighting men."

(signed) *G. C. Marshall*
*E. J. King*
*William D. Leahy*
*Dwight D. Eisenhower*
*Douglas MacArthur*
*C. W. Nimitz*
*H. H. Arnold*

MECO Lubricator Protects a Number of Curves

**MECO Curve Rail Lubricators**—Prolong the remaining life of present curve rails 2 to 4 times—and when rail is relaid, they stay on the job to reduce new curve rail wear, too.

**MAINTENANCE EQUIPMENT COMPANY**
RAILWAY EXCHANGE BUILDING ★ CHICAGO, ILLINOIS

# HIGH-BALLING
## ON A CLEAR TRACK
### ... with the SAFETY FACTOR of
### RELIANCE HY-PRESSURE HY-CROME
## SPRING WASHERS

War-time schedules demand top performance of your right-of-way. Trains are heavier, rolling faster. Troops and supplies for the Armed Forces must move safely and on time. Civilian freight and passenger service cannot be relaxed. Every improved method of maintaining efficient track must be used . . . and Reliance Hy-Pressure Hy-Crome Spring Washers are doing their part.

Reliance Hy-Pressure Hy-Crome Spring Washers contribute an added factor of safety at rail joints. Correct bolt tension is assured by Reliance design which provides constant thrust to compensate for inevitable looseness resulting from wear. Keep track bolts secure with Reliance Hy-Pressure Hy-Crome Spring Washers.

*"Edgemark of Quality"*

**EATON**

**EATON MANUFACTURING COMPANY**

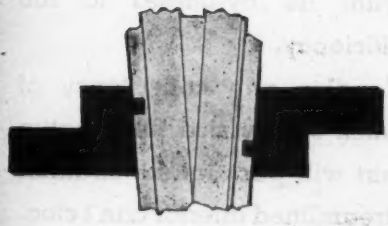
*Write* on your letterhead for Reliance Track Folder showing the various Spring Washers of the Hy-Crome family and their uses.

**MASSILLON, OHIO** *Reliance Division*

***Sales Offices:*** **New York • Cleveland • Detroit • Chicago • St. Louis • San Francisco • Montreal**

***SPEED VICTORY - BUY MORE BONDS IN THE MIGHTY 7th***

# These TWINS are always welcome



These illustrations show clearly why Twin-Hook Frog Plates are adaptable to several tie positions.

They're Bethlehem's Twin-Hook Frog Plates—and, like most identical twins, they're usually seen together. You'll seldom find one without the other.

Note what sets them apart from the crowd—the hook that's an integral part of each plate. See how these two hooks lock the frog in position. Even severe lateral thrust can't budge 'em. That means a well-anchored frog, and better alignment.

Here, though, is where the twins really shine: they eliminate the need for a special plate at every tie position. The pictures tell you why. Because each of the twins is equipped with a hook and each punched with spike holes, you can use any pair at numerous different points under the frog.

Twin-Hook plates are available in several lengths, making it possible to secure exactly the right combination for any frog, regardless of angle. They can be furnished with either a low hook for rail-bound frogs or a high hook for the cast type.

Ask a Bethlehem man for further details. He'll be glad to show you why so many thousands of these twin plates are in service on the country's leading railroads.

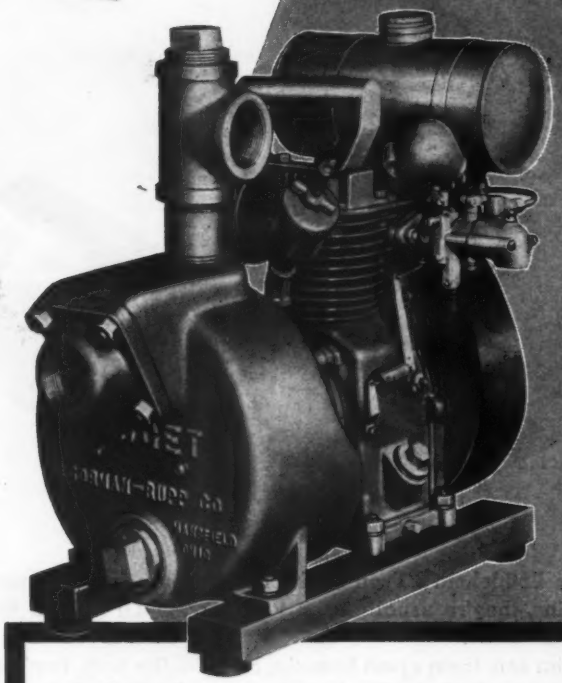
★ BETHLEHEM STEEL

## BETHLEHEM TWIN-HOOK FROG PLATES ★



Published monthly by Simmons Boardman Publishing Corporation, 105 W. Adams St., Chicago 3, Ill. Subscription price: United States and Possessions, and Canada, $2.00; Foreign, $3.00. Single copies 35 cents. Entered as second-class matter January 20, 1933, at the post office at Chicago, Ill., under the act of March 3, 1879, with additional entry at Mount Morris, Ill., post office. Address communications to 105 W. Adams St., Chicago 3, Ill.

# PUMPS SIX TIMES ITS WEIGHT IN WATER EVERY MINUTE



Smallest of more than 50 models of Gorman-Rupp centrifugal pumps, the Midget can do hundreds of handy pumping jobs. Here's why:

(1) Small, compact, weighs 60 pounds complete, can be carried to jobs on track speeder and easily handled by one man.

(2) Automatic self-primed. When the engine starts, the water starts. No valves to tinker with; no by-passes to rob efficiency.

(3) Handles any consistency of muck or any size solid matter that will pass intake strainer. Streamlined interior can't clog.

(4) Pumps more per gallon of fuel—more per pound of pump—more for its size—than any other pump on the market.

Study this table of facts on the Gorman-Rupp Midget and a few other typical larger models and see where they will fit into your various water-handling problems.

| Capacity in Gals. per Hour with pump 15 ft. above water | TOTAL HEAD (incl. friction) | | | |
|---|---|---|---|---|
| | 30 ft. | 40 ft. | 50 ft. | 60 ft. |
| MIDGET (60 lbs.) | 3180 | 2880 | 2160 | 1500 |
| EAGLE (120 lbs.) | 10200 | 8400 | 6300 | 2700 |
| MODEL 40-M (1080 lbs.) | 34500 | 33900 | 32700 | 30600 |
| MODEL 90-M (1600 lbs.) | 76800 | 73800 | 69600 | 63000 |

GORMAN-RUPP PUMPS
UNSURPASSED FOR PUMPING FAST

## THE GORMAN-RUPP COMPANY

MANSFIELD, OHIO

# EVERY WARREN HEAVY HAND TOOL RECEIVES UNIFORM TEMPERING

## . . . automatically

After forging and hardening, high quality heavy hand tools are tempered to relieve stresses and strains set up during quenching.

The tempering operation must be closely controlled as to time and temperature so the tool is finished at the optimum hardness with toughness which will result in a long-lived reliable tool. Hence, the sixth sense which the old-timers used cannot achieve the uniformity and reliability which the fully automatic electric controls obtain.

Care in manufacture, step by step, produces quality Warren Heavy Hand Forged Tools which have sharp, tough edges and points, accurate radii on striking faces, and a bevel at the right angle.

The Devil Tools brought out by Warren Tool Corporation 23 years ago were the first alloy tools in the field and have been the constant leaders ever since.

**He used to say:** "I guess batch four has a little while to go."

**Now he looks at the control and says:** "The furnace will automatically shut off in 2 minutes, and I had better get ready to pull it."

*Automatic controls eliminate guesswork in the manufacture of Warren-teed and Devil Tools for the railway and hardware industries—sledges, mauls, picks, mattocks, hoes, adzes, track chisels, track wrenches, lining bars, claw bars (including the famous Flex-Toe), and other types of tools.*

WARREN TOOL CORP. • WARREN, OHIO

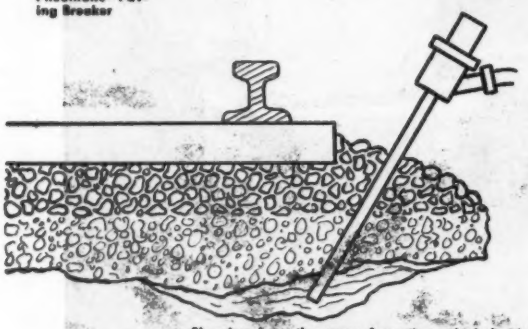
Miles of roadbed have been restored by cement grouting to fill water pockets. Train movement not disturbed.

No. 23 Thor Paving Breaker drives points for sub-ballast Grouting

Driving a mud-point with a Thor Pneumatic Paving Breaker

# Thor BREAKER

## POWER PLANT OF THE NEW MAN-SAVING GROUTING METHOD



Showing how the same formation which holds water also holds cement and asphalt-cement grouting when pumped in through mud-points driven by Thor Paving Breakers. After hardening, the cement fill permanently excludes further water.

By driving mud-points with Thor Pneumatic Paving Breakers, husky men do more work with less fatigue—lighter men are able to handle the job—and mile after mile of track is stabilized at record speed in spite of increasing labor shortages.

They deliver power with low air consumption, new, speed and low cost. Ease of handling with minimum vibration and balanced design reduces worker fatigue keeps the job rolling.

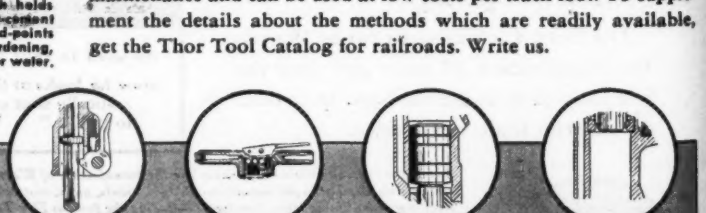
### MAINTENANCE-OF-WAY DEPARTMENTS URGED TO INVESTIGATE

The sub-ballast grouting method has proved a great advance in maintenance and can be used at low costs per track foot. To supplement the details about the methods which are readily available, get the Thor Tool Catalog for railroads. Write us.

Thor

PORTABLE *Pneumatic* TOOLS

*Branches in Principal Cities*



*New Latch Retainer*—Simple, highly efficient spring detent holds tool firmly without adjustment. Released easily.

*Back Head*—Drop forged and heat-treated alloy steel of special design for lasting rigidity. Rubber grips keep handle always cool.

*Piston Hammer*—Block type, hardened and ground from selected steel with 4 oil grooves. Maintains cylinder-wall lubrication without scoring by piston.

*Cylinder*—Full effort given to each hammer blow by exclusive design. Dead air cushion prevents compact on tappet cost.

**INDEPENDENT PNEUMATIC TOOL CO.**

600 W. Jackson Blvd., Chicago 6, Ill.

New York Los Angeles

# unloading....

Here is a job typical of Northwest versatility—a job a track type machine can't do! Load your Northwest right on the car under its own power. It travels from car to car, kicking off riprap or ballast—unloading rail, and track equipment—whatever you want, where you want it!

And that is only the beginning of Northwest versatility. It is quickly convertible to a Dragline or Crane for all classes of work from drainage and building shoulders to handling storeyard material or shop equipment.

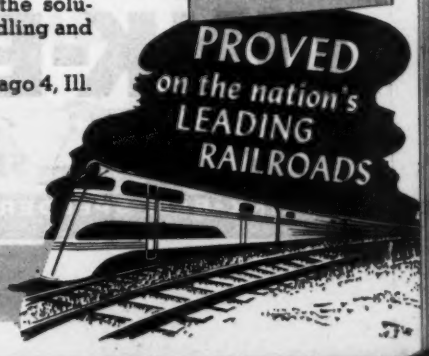
Easy steering Northwest Crawlers take it practically anywhere for off the track service as well as jobs on the right-of-way. Or if you need rubber tired equipment there is a complete line of Truck Cranes, Truck Shovels and Wagon Cranes.

The postwar period is going to call for every ounce of versatility in maintenance machinery to assure railway profits. The Northwest is a proved unit on the railroads and there is a size and type for the solution of every railway material handling and excavation problem.

NORTHWEST ENGINEERING CO., 1713 Steger Bldg., 28 E. Jackson Blvd., Chicago 4, Ill.

# NORTHWEST

THE ALL PURPOSE RAILROAD MACHINE
SHOVEL • CRANE • DRAGLINE • PULLSHOVEL



# IT'S THE *Maneuverable* CARGOCRANE

The way it gets in and out of tight quarters, the quick, powerful lift and smooth, easy control are making the CARGOCRANE an indispensable in railroad yards, warehouses, and shops.

Loading or unloading, stacking or handling—even raising car bodies from trucks and other heavy repair jobs are done more quickly and easily, with the CARGOCRANE—You will want these advantages—Write for special bulletin 2033—today!

GET A POWERFUL LIFT WITH A LINK-BELT SPEEDER

# LINK-BELT SPEEDER

*Builders of the Most Complete Line of*
SHOVELS-CRANES-DRAGLINES

LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO 9, ILL.
A DIVISION OF LINK-BELT COMPANY

# PIPES CLEANED

## *Faster—Better—Economically*

Before Cleaning | During Cleaning | After Cleaning

1—SPECIALIZED TOOLS

2—EXPERIENCED ENGINEERS

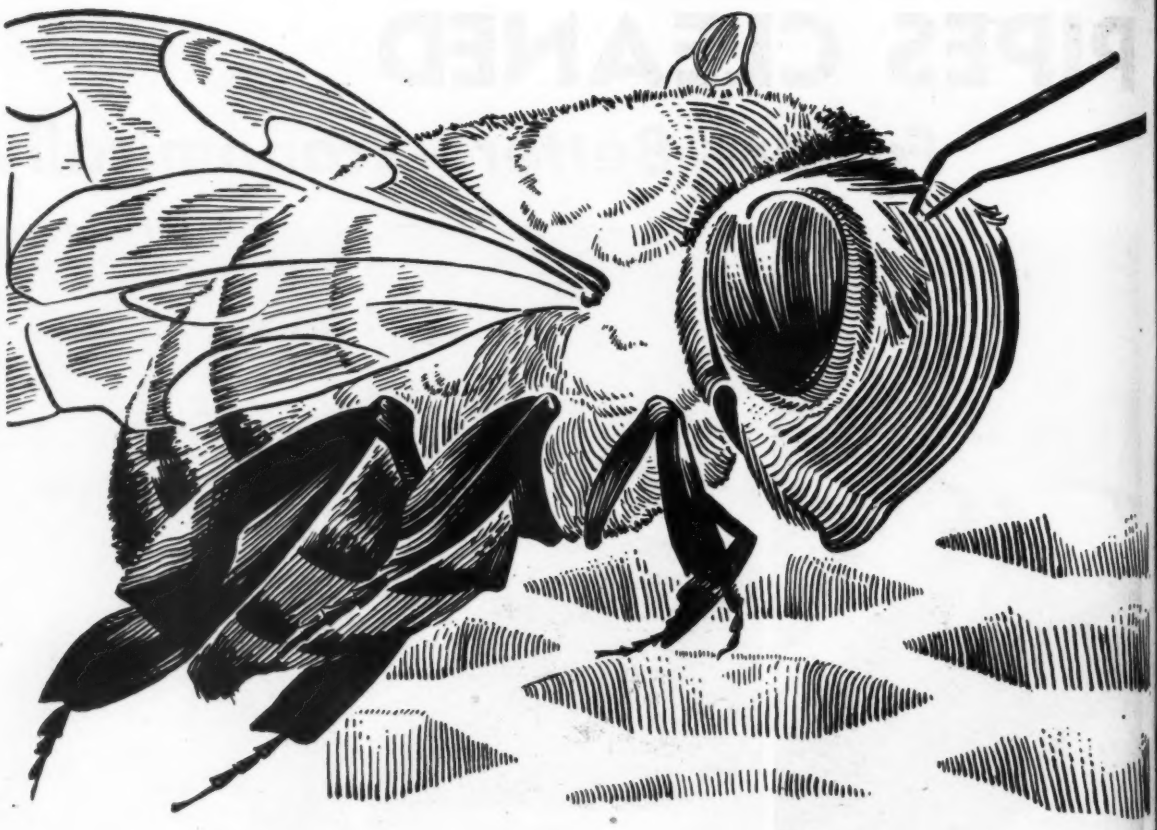
are the two main factors why Pittsburgh Pipe Cleaner Company can do a more thorough and reliable pipe cleaning job for your railroad than anyone else.

Write today for information about our complete contract pipe cleaning service.

# PITTSBURGH PIPE CLEANER COMPANY

433 Melwood Street, Pittsburgh 13, Penna.

PHILADELPHIA · NEW YORK · BALTIMORE · WASHINGTON · CHICAGO · ST. LOUIS · DETROIT



# A PATENTED PROCESS

## THAT CAN'T BE DUPLICATED

Probably in the beginning, Nature decided to play safe, so she made the honey-bee's process too complicated for man to master.

The Morrison Metalweld Process of frog and crossing rejuvenation is complicated too; far too complicated to be *safely applied* by any but highly trained SPECIALISTS. That's why the process is patented...in order that we may control the materials as well as the means and methods of application. Only under these conditions can the work be guaranteed as thoroughly safe, lasting and economical.

We handle this type of work for several main line railroads on an annual contract arrangement. We are equipped to do the same for you.

MORRISON METALWELD PROCESS, INC.
A SUBSIDIARY OF
MORRISON RAILWAY SUPPLY CORP.
EXECUTIVE OFFICES · · · BUFFALO 12, N. Y.
CHICAGO 4, ILL. BIRMINGHAM 3, ALA.

PUT A

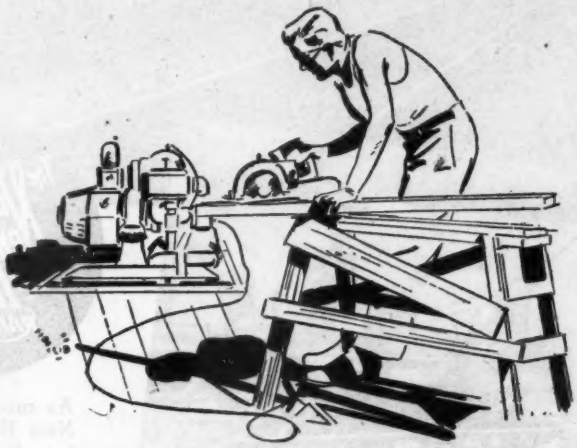
# HOMELITE

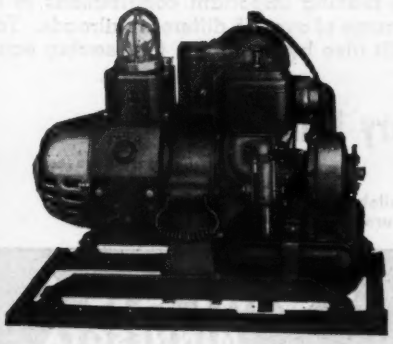
## ON THE JOB

AND GET IT DONE

MUCH FASTER

**Small enough for one man to carry, a 2000 watt Homelite Gasoline-Engine-Driven Generator produces enough electric power to operate time-saving tools in the hands of several men.** *





**Capable of producing more horsepower per pound than other portable generators, a Homelite gives you longer and better service with less trouble and maintenance. Self-lubricating, air-cooled, and equipped with over-size ball bearings, the Homelite built-in two-cycle gasoline engine stands up dependably under all types of tough working conditions.**

* **Just one of many uses for a Homelite. Send for our new booklet showing all the time-saving uses of Homelite Portable Generators, Pumps, and Blowers.**

**HOMELITE CORPORATION**

PORT CHESTER, NEW YORK

*Portable* PUMPS • GENERATORS • BLOWERS

# To SPEED-UP Tie Renewals

The New York, New Haven and Hartford Railroad Co. uses

## Woolery Tie Cutters

As modern, powerful locomotives enable the New York, New Haven and Hartford to move war traffic faster, so, too, do modern, soundly engineered Woolery Tie Cutters aid in speeding-up tie renewal work.

Designed and built by engineers that know railroad requirements, Woolery Tie Cutters in day to day use are exhibiting the qualities that make tie replacement easier, quicker and less expensive.

Hundreds of Woolery Tie Cutters, Weed Burners and Creosote Sprayers are making important contributions to the maintenance programs of over 75 different railroads. Your railroad can benefit also by using this time-saving equipment.

### Woolery Maintenance Units

Tie Cutters — Creosote Sprayers

Weed Burners

Available in 5-burner, 3-burner 2-burner and 1-burner models

## WOOLERY MACHINE COMPANY

MINNEAPOLIS — Pioneer Manufacturers of — MINNESOTA

RAILWAY MAINTENANCE EQUIPMENT

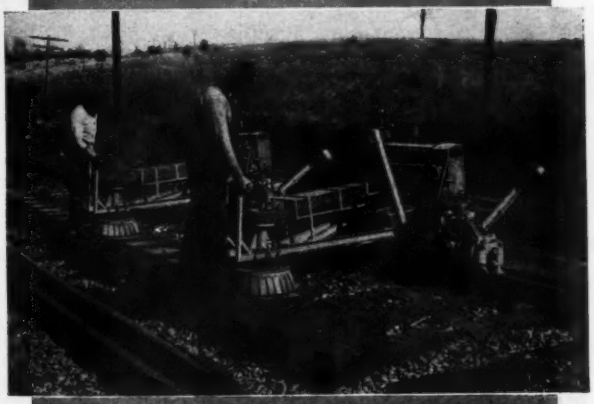
RAILWAY WEED BURNERS · MOTOR CARS · TIE CUTTERS · TIE SCORING MACHINES · RAIL JOINT OILERS · CREOSOTE SPRAYERS · BOLT TIGHTENERS

EXCLUSIVE EXPORT REPRESENTATIVES: PRESSED STEEL CAR COMPANY, INC., PITTSBURGH, PENNA.

# NORDBERG POWER TRACK TOOLS

## *Help Solve the Manpower Problem*

The Nordberg Hydraulic Power Jack is typical of the labor saving possibilities of Nordberg tools. The operator replaces eight to twelve men that would have been required if hand jacks were used.



One Adzing Machine easily replaces six to ten men working with hand adzes. The machine finished seats for new rail are so far superior to hand prepared seats that there is no comparison in quality.

The labor and time saving advantages of Nordberg power track tools are of greater importance now than ever before. These tools used by all Class I roads are helping solve the problem of manpower shortage. Not only do they reduce the man hours of maintenance jobs but since the work is done faster, track is put back into service sooner. Another advantage is that these tools do a better quality of work than is possible with hand labor.

In the design of this line of power tools has been incorporated the ideas of many maintenance men for improving such operations as laying rail, reconditioning rail, switches, etc., surfacing and ballasting work and the uniform tightening of track bolts.

Solve today's maintenance problems by putting Nordberg power tools on the job. Write for bulletins describing these labor and time saving machines.

**NORDBERG POWER TRACK TOOLS DEVELOPED FOR YOUR JOBS**

| | |
|---|---|
| Adzing Machine | Surface Grinder |
| Spike Puller | Flexible Arm Grinder |
| Track Wrench | Utility Grinder |
| Rail Drill | Midget Grinder |
| Power Jack | Track Shifter |

NORDBERG MACHINERY

**NORDBERG MFG. CO.** MILWAUKEE WISCONSIN

Export Representative—WONHAM Inc.—44 Whitehall St., New York

# SMOOTH AS A RIBBON!

Pounding locomotive drivers and spinning car wheels, working harder and faster today than ever before, are taking a heavy toll on track. Track maintenance is excessive, especially at the joints where ends batter or "cup out"—knocking rail out of line or surface—loosening bolts, bars, or bonds.

Thermit welding of rail joints is the answer to this problem. Continuous rail eliminates joint maintenance costs, increases rail life, minimizes rail replacement and provides smoother operation at higher speeds. And Thermit welded track is especially valuable for short stretches such as tunnels, grade crossings or paved streets, where corrosive conditions are severe or maintenance presents added difficulties.

The Thermit process yields rail-quality weld metal, forming a strong, dense, permanent joint—free from internal stresses. It requires only simple, portable equipment. And your own crews can do the welding after brief instruction by an M & T representative.

• • •

Write for complete facts to Metal & Thermit Corporation, 120 Broadway, New York 5, N. Y.—Albany, Chicago, Pittsburgh, South San Francisco, Toronto.

**Thermit Welding**

CONTINUOUS

# LET US HELP YOU CONSERVE LABOR, MATERIAL AND MONEY

ARMORED

INSULATED RAIL JOINTS must serve a dual purpose—as a means to insulate one rail end from another, and as a track joint to keep the rails in surface and alignment.

Insulation must be renewed when it becomes worn or damaged to an extent which could impair the proper insulating functions or cause damage to rail ends. Such renewals involve not alone the cost of new material, but also the even greater cost of labor and time expended by track and signal maintenance forces.

The frequency of necessary renewals depends largely upon:

1—Quality of fibre insulation.
2—Accuracy of design and fit of fibre insulating parts.
3—Careful, correct installation of joint.
4—Proper maintenance of joint and ties, and drainage of road-bed.

We, as designers and manufacturers for the past 50 years, of the insulated joints used by all railroads in the United States and Canada, have a vital interest in their durability and satisfactory service. We have developed the refinements of design and manufacture which produce an efficient device, and we ask that its efficiency be maintained by the use of renewal parts manufactured under our own strict supervision and our own expertly trained inspection service. This insures to our customers the best attainable quality of material, and the utmost possible accuracy to dimension, shape and fit.

For the information and guidance of track and signal maintenance forces, we have prepared instructions governing the proper application and maintenance of insulated joints, which, if followed, will prolong the life of the fibre parts, will help preserve the rail ends from damage and will avoid the necessity for frequent, costly renewals. Copies of these instructions will be furnished without cost, upon request.

## INSULATED RAIL JOINTS AND FIBRE RENEWAL PARTS

## THE RAIL JOINT COMPANY INC.

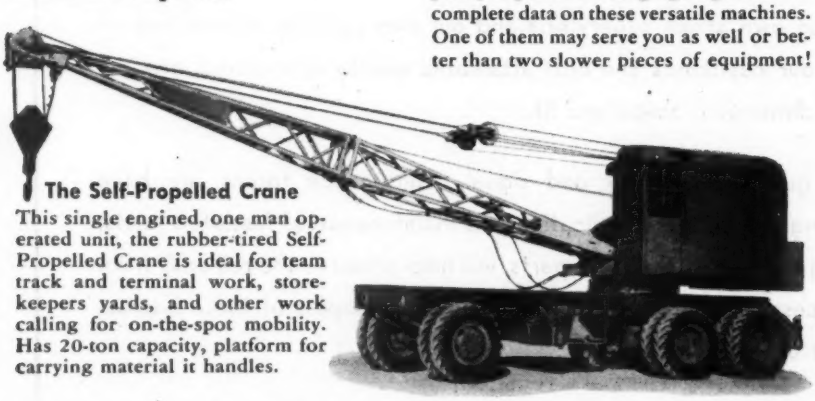
50 CHURCH STREET NEW YORK, N. Y.

# Speed your off-track work with *Rubber Tired* LORAINS

Fast on the job and speedy between jobs, rubber-tired Lorain Cranes will cover more spots, do more different kinds of work per day—help you make greater savings in time and manpower.

**The Moto-Crane**

The Lorain Moto-Crane has between jobs speed of 30 M.P.H.—can cover miles in a day and do a dozen jobs on the way. Available in 15, 20-ton capacity, with 4 and 6 wheel drive units, it has plenty of soft-ground flotation for off-the-road jobs, and plenty of power for tough going. Send for complete data on these versatile machines. One of them may serve you as well or better than two slower pieces of equipment!



**The Self-Propelled Crane**

This single engined, one man operated unit, the rubber-tired Self-Propelled Crane is ideal for team track and terminal work, storekeepers yards, and other work calling for on-the-spot mobility. Has 20-ton capacity, platform for carrying material it handles.

## 10 PLACES TO SAVE WITH LORAINS

**1.** Handling rails and frogs. **2.** Fueling and auxiliary coal storage. **3.** Cleaning ash pits. **4.** Handling scrap. **5.** Storekeepers yard and road service. **6.** Cleaning ditches. **7.** Cleaning ballast. **8.** Team track and material handling. **9.** Heavy lifts of all kinds. **10.** Bridge and other construction.

Reg. Trade Mark

thew-Lorain

THE THEW SHOVEL COMPANY
LORAIN, OHIO

CRANES · SHOVELS · DRAGLINES · MOTO-CRANES

# *Welded Piping Increases Availability of Equipment*

● When piping on locomotives and rolling stock is flame-welded by Oxweld's method, the welds are as strong as the pipe itself and will remain so for the life of the pipe. There are no leaks. Equipment may be kept in service without interruption for pipe repairs.

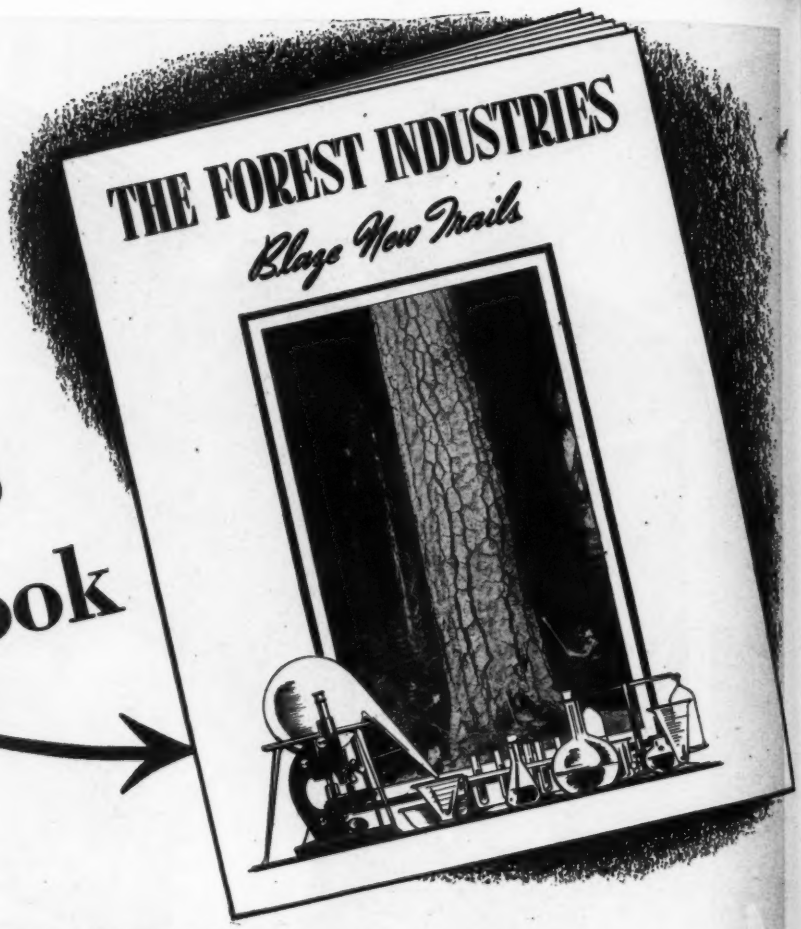
Welded piping—both ferrous and non-ferrous—in yards and shops also has these advantages—and others. The piping systems are compact and comparatively light in weight. The smooth interior and exterior walls of flame-welded piping provide high flow efficiency and make insulation easier where it is required.

Oxweld has developed dependable procedures for flame-welding all types of railroad piping. Ask an Oxweld representative for more information.

THE OXWELD RAILROAD SERVICE COMPANY
*Unit of Union Carbide and Carbon Corporation*
UCC
Carbide and Carbon Building Chicago and New York

SINCE 1912—THE COMPLETE OXY-ACETYLENE SERVICE FOR AMERICAN RAILROADS

Write for this book




# New TECO Services

This new book will be very helpful to executives, plant superintendents, chemical engineers, structural engineers and others in the wood-working, wood-chemistry and building fields.

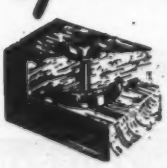
It emphasizes the importance to all industry, of wood and its by-products and its derivatives —tells of new things ahead.

The new TECO services, now available through the Wood Products Development Shop and the Wood Chemistry Laboratory, are described for the benefit of those who may have problems concerning the physical, mechanical and chemical properties of wood and wood products. Learn how to make use of TECO SHOP-LAB equipment and technical staff in solving some of your postwar problems. Write at once for your copy—fill in and mail the coupon.

**TIMBER ENGINEERING COMPANY OF WASHINGTON, D. C.**

WASHINGTON · CHICAGO · NEW ORLEANS · SAN FRANCISCO

*Specify* **TECO**



**CONNECTORS AND TOOLS**

Endorsed by Leading Lumber Manufacturers and Fabricators

Timber Engineering Company RE
1319 Eighteenth St. N. W.
Washington 6, D. C.

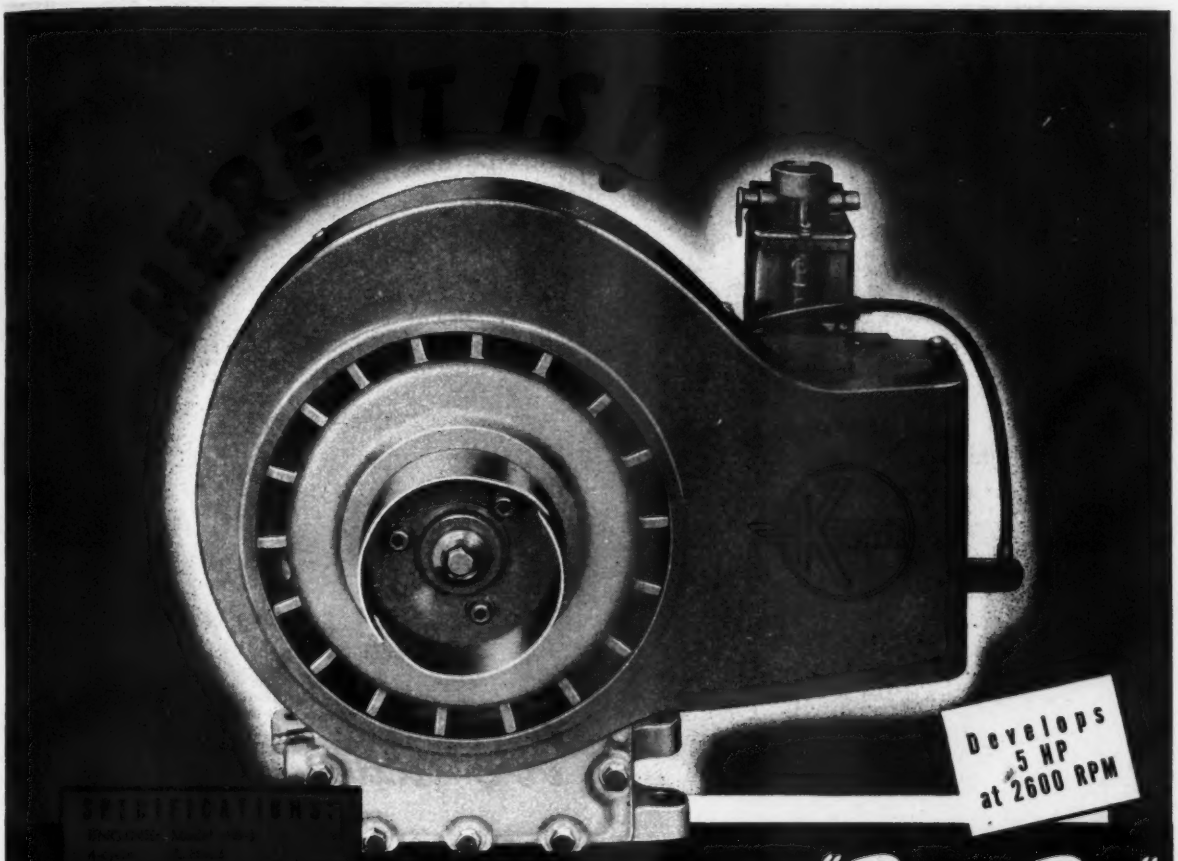
Send me a free copy of
The Forest Industries Blaze New Trails

Name _____

Firm _____

Street _____

City _____ State _____




# THE REVOLUTIONARY "Busy Bee"

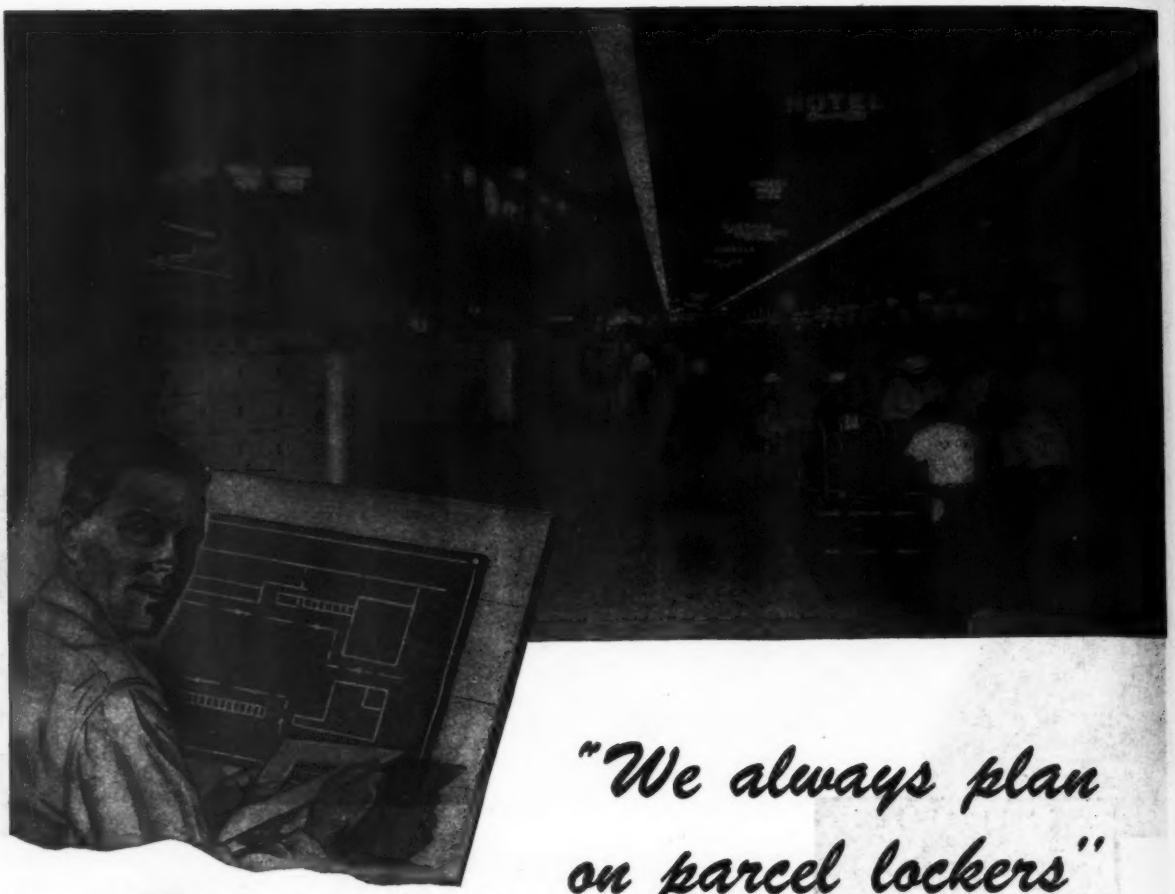
**HIGH PERFORMANCE LOW COST**
**RUGGED LIGHT COMPACT**

The revolutionary "Busy Bee" engine by Kinner embodies principles which are new as applied to small engine design and manufacturing. Daring in design and engineering, it has these unique features:

- Rated at 5 HP, it actually develops 6 at 3250 rpm.
- Aircooled, 4-cycle, L-Head.
- Horizontal cylinder, detachable—easily replaced.
- Simple, clean design makes maintenance easy.
- Light metal alloys make it lightest engine in its horsepower class—very advantageous for portable units.
- Aluminum head, piston and crankcase materially improve cooling characteristics.
- Full pressure lubrication to all bearings.
- Flat torque curve—the "Busy Bee" will "lug" under heavy loads.
- All bearing surfaces hardened—for longer life.
- Bearings large—bearing pressures low.

The Kinner "Busy Bee" is built for universal service under all conditions. Write on your letterhead for illustrated brochure, engineering data. KINNER MOTORS, INC., GLENDALE 4, CALIFORNIA.

1919 1945 ENGINE BUILDERS FOR OVER A QUARTER CENTURY



# "We always plan on parcel lockers"

This is the key to safe, quick, easily accessible, self-service parcel checking. Years of research and experience by the American Locker Company have produced a lock and key that are the very "heart" of a locker, assuring the public of the safety and protection of their luggage and parcels at all times.

**THE LOCK IS YOUR GUARANTEE**
**THE KEY IS YOUR CHECK**

ARCHITECTS and planning engineers regard parcel checking lockers as an integral part of modern transportation when they are laying out new stations or renovating old ones. Widespread use and demand by the general public has made self-service checking an important part of a station's facilities.

Using smart, modern equipment designed to harmonize with the new trends in transportation, architects and planning engineers place lockers at a point where eye appeal and service meet. Thus they avoid creating congested areas and provide the public with maximum service in minimum space. American Locker Service engenders public goodwill and adds to the income of the transportation company.

***American Locker Company consultants will confer on checking problems and make surveys and recommendations without obligation.***

# AMERICAN LOCKER COMPANY, Inc.

211 CONGRESS ST., BOSTON 10, MASS.

*DISTRICT OFFICES*

BOSTON NEW YORK PHILADELPHIA PITTSBURGH ATLANTA CLEVELAND CHICAGO DALLAS LOS ANGELES

# HIGH-BALLING AIR

Here's another member of the Blue Brute Track Team — a modern, ahead-of-its-time compressor on track chassis that is as full of sure-fisted power as it is modern.

This is the rail car compressor you can count on . . . ready to help you with your present burdens today. Smoother air delivery . . . smoother operation . . . construction that promises many thousands of feet of low-cost air compressing . . . furnished in propelled or non-self-propelled types.

*Reg. U. S. Pat. Off.

Feather* Valves — simplest known — keep it easy-breathing. Cradling engine and compressor in one unit by three-point suspension avoids distortion. Full force-feed lubrication keeps the "works" healthy.

Moving off and on the tracks is a cinch. Tie this fellow up with a crew of Blue Brute WTT-7 Tie Tampers — lighter but stronger, with new leak-proof air throttles — and you'll have a Blue Brute Track Team that can set you some new records.

41-5-1

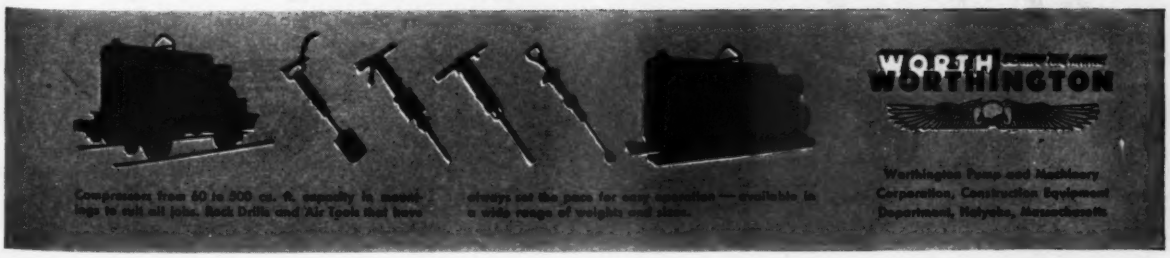
**Behind the Fighting Fronts with**

**BLUE BRUTES**

Right behind the fighting men come the Blue Brutes, helping speed the building of better railroads to get men and materials to the front fast. Blue Brute Track Teams also work overtime here at home helping U. S. railroads do the biggest transportation job in history.

**Get more WORTH from air with WORTHINGTON**

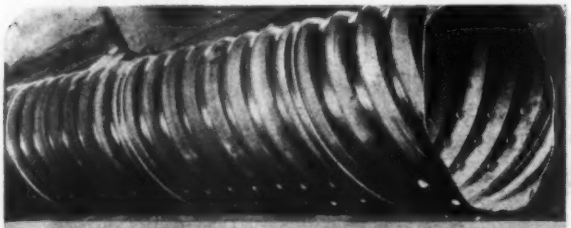
# BUY BLUE BRUTES


WORTH
WORTHINGTON
Compressors from 60 to 300 cu. ft. capacity in models to suit all jobs. Rock Drills and Air Tools that have always set the pace for easy operation — available in a wide range of weights and sizes.
Worthington Pump and Machinery Corporation, Construction Equipment Department, Holyoke, Massachusetts

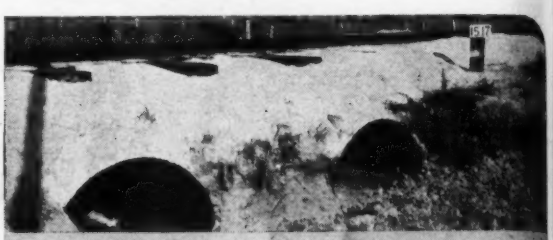
THESE SERVICE-TESTED PRODUCTS

# WILL SOLVE YOUR DRAINAGE PROBLEMS

Here are some of the Armco drainage products that can help you cut maintenance costs and assure more efficient drainage systems for your overworked roadbeds.

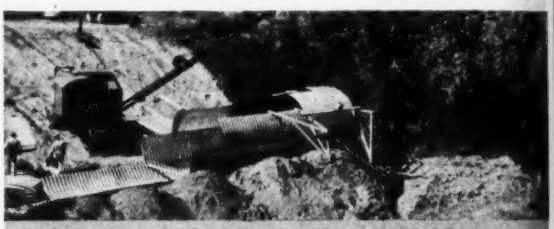


**PERFORATED PIPE.** Ideal for all kinds of subdrainage requirements. This flexible, sturdy pipe has ample infiltration capacity, will not readily fill up with solids. It is made with circumferential or helical corrugations.

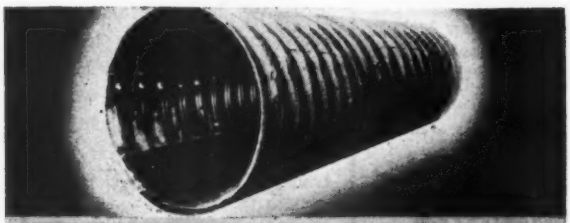


**PIPE-ARCH.** Pipe-Arch has many advantages when used for low-clearance culverts. For many service conditions Pipe-Arch is provided with bituminous paved invert to resist wear in the bottom.

**RETAINING WALLS.** These are rugged steel bins completely encased on all four sides. Earth or other material inside the bins gives weight and stability. Walls prevent encroachment of streams or embankment slopes.

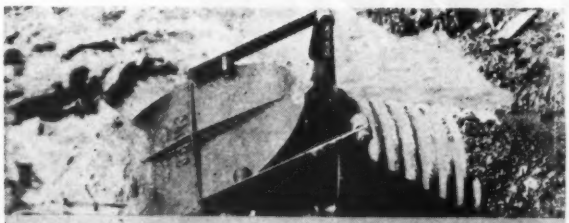


**MULTI PLATE PIPE AND ARCHES.** Manufactured for pipe (60" to 180" diameters) and for arches (15' to 25' and larger). Excellent for large culverts and small bridges. MULTI PLATE has ample strength for large sizes and high fills.



**ASBESTOS-BONDED PIPE.** This is a galvanized corrugated pipe with a thick smooth pavement of a special bituminous material over a layer of asbestos felt. Ideal wherever soil or the contents flowing through pipe may cause corrosion.

**LINER PLATE.** Used for lining tunnels and shafts. These are corrugated, flanged circular segments which are bolted together. Plates are strong though light. Manufactured in two types, standard and heavy duty.



**DRAINAGE GATES.** Employed for flood control, drainage, sewer outfalls and reservoir outlets. Adaptable to rectangular or circular openings. Calco Drainage Gates are made to fit all standard diameters from 8 to 84 inches.

**Write for quotations and additional information. Armco Railroad Sales Co. Incorporated, 831 Curtis Street, Middletown, Ohio.**

ARMCO

**ARMCO RAILROAD SALES CO. INC.**

DEPENDABLE
RAIL ANCHORS
Lead to
Safety and Economy
in Track
Maintenance
CHICAGO • NEW YORK • DENVER
WASHINGTON • ST. LOUIS
THE P. & M. CO.
CLEVELAND • ST. PAUL
BOSTON • SAN FRANCISCO

# BARCO
## TYTAMPERS

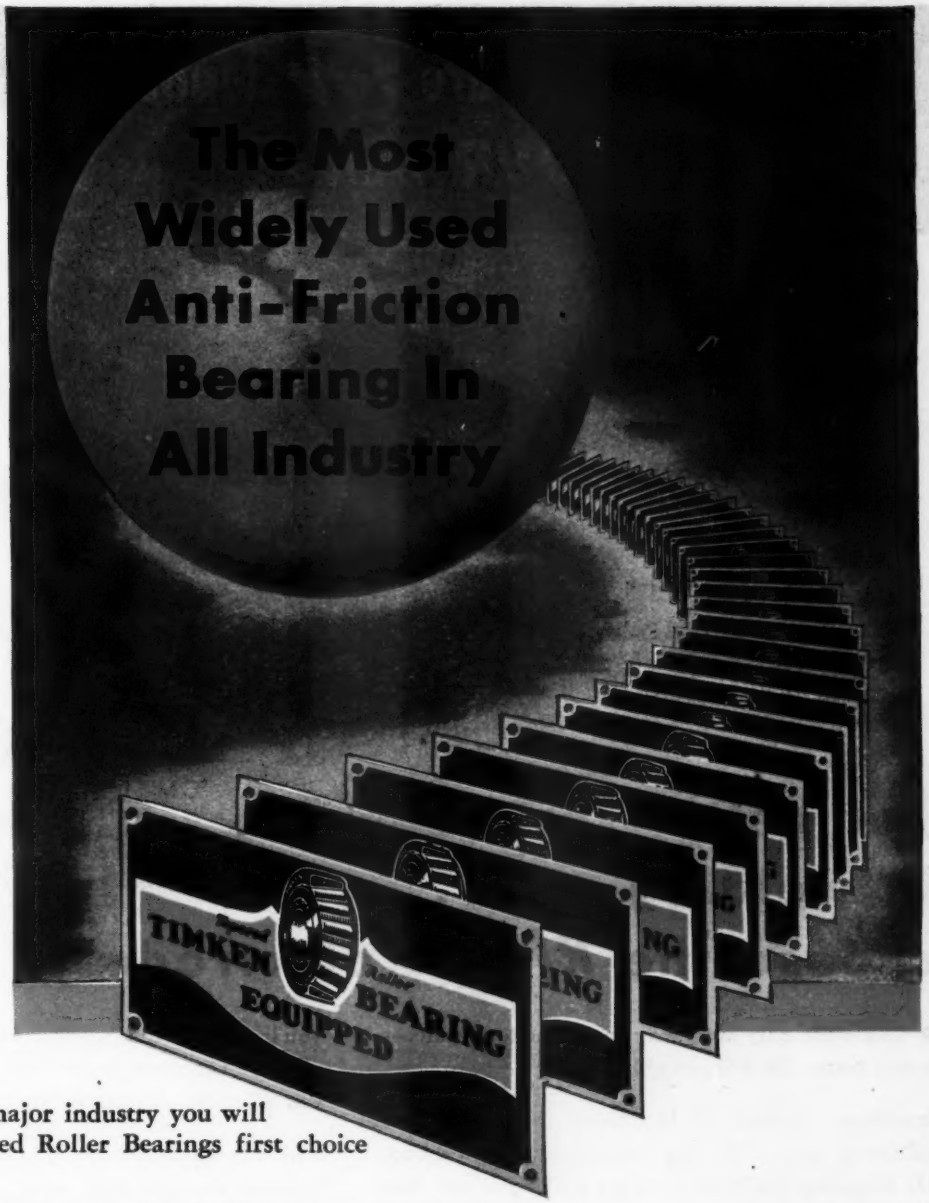
### for smoother roadbeds

Efficient maintenance of right-of-ways reduces wear and tear on vital and currently irreplaceable rolling stock. In this all-important service, Barco Unit Tytampers are invaluable . . . helping overcome labor shortages, handling dozens of different jobs quickly, capably and economically. Investigate these famous tools.

**BARCO** UNIT TYTAMPERS

THE FREE ENTERPRISE SYSTEM IS THE SALVATION OF AMERICAN BUSINESS

BARCO MANUFACTURING COMPANY, NOT INC., 1805 Winnemac Ave., Chicago 40, Ill. • In Canada: The Holden Co., Ltd., Montreal, Can.




In virtually every major industry you will find Timken Tapered Roller Bearings first choice of engineers.

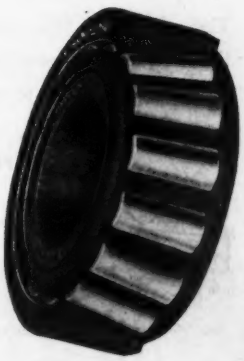
In gigantic steel mills — machine tools — motor cars and motor trucks — in paper making and in road building equipment — in countless types of war material, Timken Bearings are delivering amazing performance.

Such widespread acceptance is based simply and solely on the unexcelled service that Timken Bearings have given for nearly 50 years.

Our many years of research — our wide practical knowledge — plus Timken Alloy Steels and our unequalled manufacturing resources, are the basic reasons for the unfailing dependability of Timken Roller Bearings.

See that the trade-mark "TIMKEN" is on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.

***"All there is in Bearings"***



**TIMKEN**

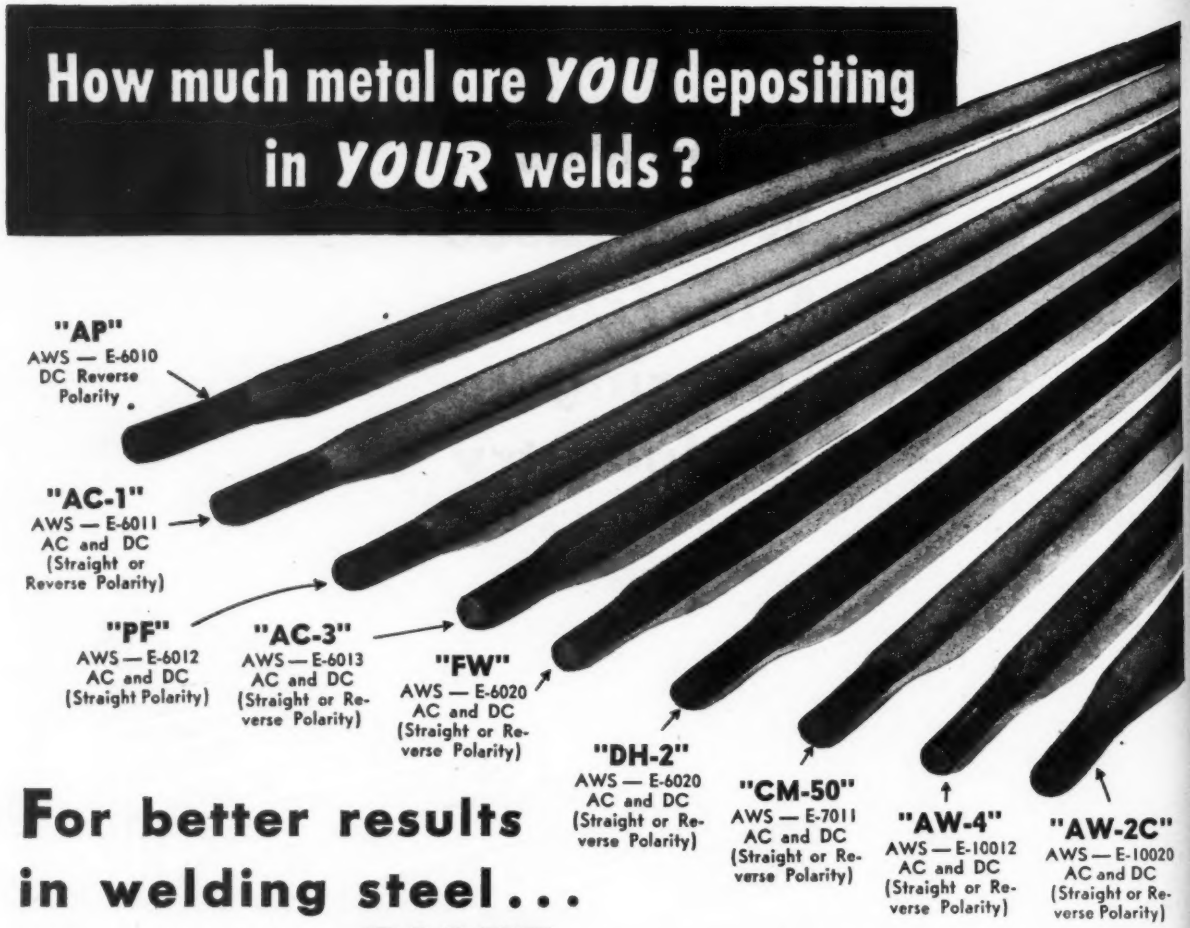
TRADE-MARK REG. U. S. PAT. OFF.

**TAPERED ROLLER BEARINGS**

*Timken Bearings, Timken Alloy Steels and Tubing and Timken Removable Rock Bits*

COPYRIGHT 1945 BY THE TIMKEN ROLLER BEARING CO.

# How much metal are *YOU* depositing in *YOUR* welds?




## For better results in welding steel... choose the *RIGHT* electrode!

● That's the only sure way to get better results — lower costs. Give it some thought!

Important factors in improving your electrode efficiency are: (1) slag control during welding, (2) minimum arc blow, (3) easy striking of arc, and (4) elimination of crater cracking. But don't stop there. Consider also such points as good penetration, burn-off rate, smooth bead appearance, good X-ray properties, and rate of deposition in pounds per hour.

The electrode that gives you the best balance of these qualities—on your specific job—is the *right* electrode for you to use. If it's for welding steels, you'll find it among the P&H Electrodes shown above. Let your nearest P&H representative help you select it. Or write us.

P&H also manufactures a full line of electrodes for welding stainless and alloy steels, as well as for hard surfacing. Ask for literature.

**P&H**

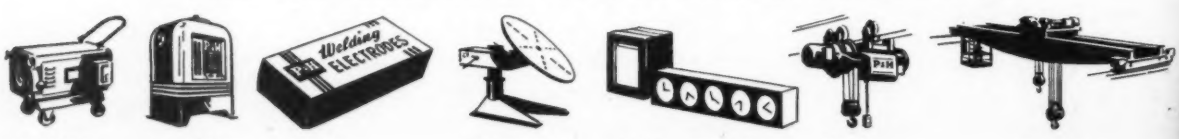
**WELDING ELECTRODES**

4606 W. National Avenue
Milwaukee 14, Wis.

**HARNISCHFEGER CORPORATION**

HOISTS · WELDING ELECTRODES · MOTORS · P&H · EXCAVATORS · ELECTRIC CRANES · ARC WELDERS

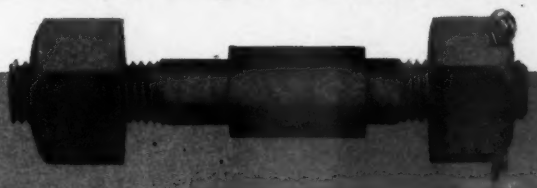
**A COMPLETE ARC WELDING SERVICE — FROM THIS ONE DEPENDABLE MANUFACTURER**



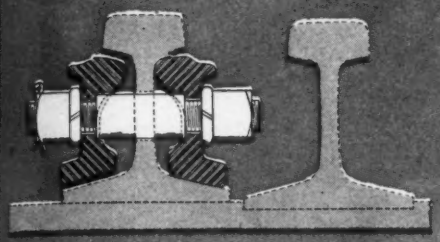

DC Welders · AC Welders · Welding Electrodes · Welding Positioners · Welding Production Control Systems · Electric Hoists · Electric Cranes

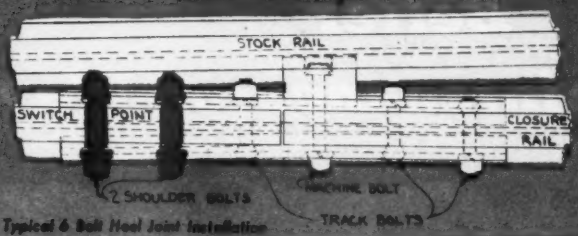
# PETTIBONE MULLIKEN *One Piece* SHOULDER BOLT

## *Replaces Two Piece Pipe Thimble and Track Bolt*

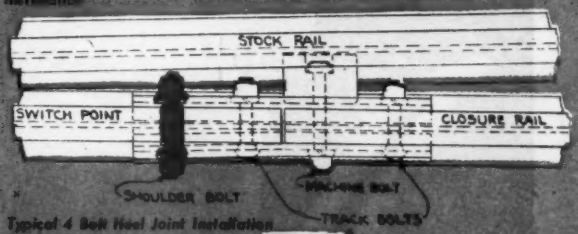


TYPE A



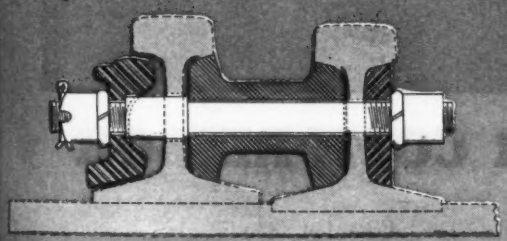


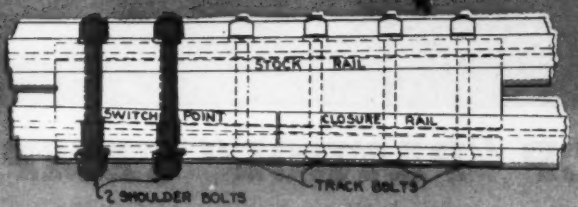

*Typical 6 Bolt Heel Joint Installation*



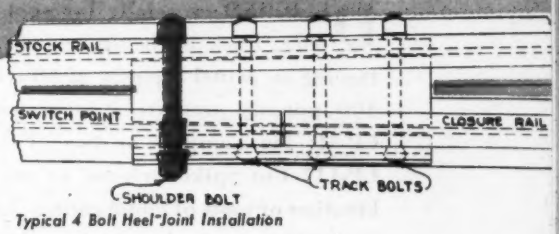

*Typical 4 Bolt Heel Joint Installation*

TYPE B






*Typical 6 Bolt Heel Joint Installation*




*Typical 4 Bolt Heel Joint Installation*

***ELIMINATES:*** Crushed or corroded pipe thimbles • Misfit pipe thimbles • Loose bolts at heel joint • Forgotten pipe thimbles

***ASSURES:*** Permanent free hinge action • Tight bolts • Stronger Assembly • Less Maintenance

***REDUCES:*** Man power needed to throw hand operated switch • Spring power needed to return points of spring switch • Electric power consumed at remote controlled switch

### How to Order

*We will furnish plan of proper bolt upon receipt of following:*

*A—PLAN OF SWITCH*
*B—DETAIL CROSS-SECTION OF HEEL JOINT*
*C—DETAIL CROSS-SECTION OF JOINT BAR USED*

*"Quality Since 1880"*

# PETTIBONE MULLIKEN CORPORATION

4710 West Division Street, Chicago 51, Illinois

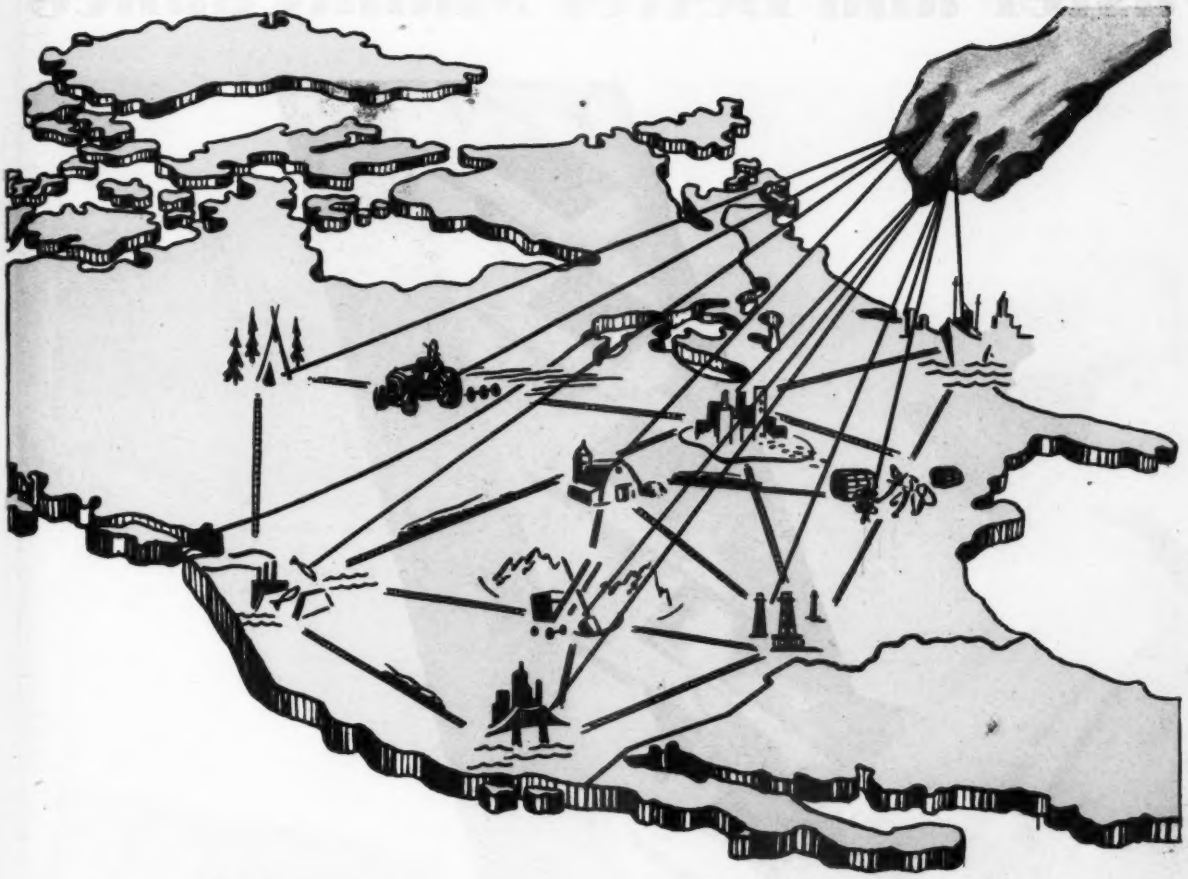
# CP "PATROL" TAMPER COMPRESSOR

DESIGNED especially for spot tamping, track or bridge repair work. Having an actual capacity of 60 c.f.m. at 100 pounds pressure it operates four CP-3D Tie Tampers or two CP-116 or CP-117 Cut Spike Drivers, or any combination of tools of equal rating. No cooling water required – both compressor and engine are air-cooled. The engine has a power reserve of 50%, therefore is suitable for high altitude or tropical operation without overloading. Easily transported. Easily handled – front and rear retractable dollies provide tight-spot, single-rail handling 'on track' and 4-point support 'off track.' Write for S. P. 2022.

★★★★★★★★★
PNEUMATIC TOOLS
ELECTRIC TOOLS
(Hicycle...Universal)
ROCK DRILLS

CHICAGO PNEUMATIC
TOOL CP COMPANY
General Offices: 8 East 44th Street, New York 17, N. Y.

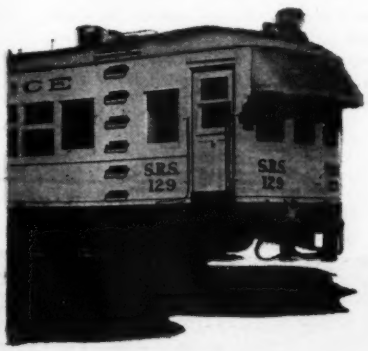
★★★★★★★★★
AIR COMPRESSORS
VACUUM PUMPS
DIESEL ENGINES
AVIATION ACCESSORIES



# Coordinating A Continent

NEARLY three hundred thousand miles of railroad track form a great spider-web over the seven and one-half million square miles of land that is this continent. Over a million Americans earn their livelihood by serving the railroads of the country. This vast network ties a continent together—coordinates its wide-spread functions—and makes our countries an efficient unit.

American Railroads are famed the world over for their fine record of safety—and the wide-ranging Detector Cars of Sperry's famed yellow fleet are recognized as an important contributor to this safety record.

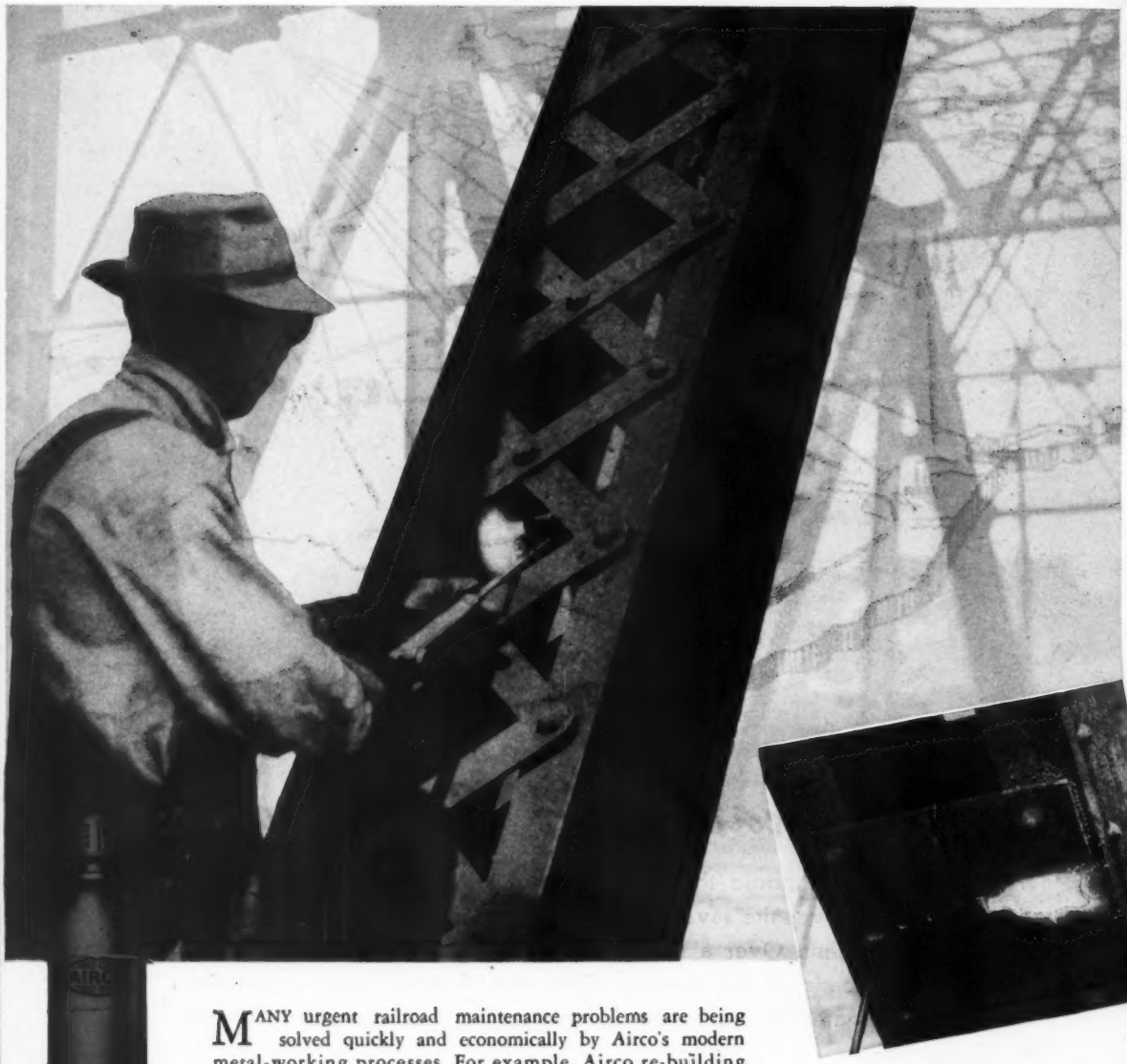



*—A Sperry Contribution in Peace and War—*

SPERRY
*Rail Service*

HOBOKEN, NEW JERSEY CHICAGO, ILLINOIS

# Faster and Better Maintenance



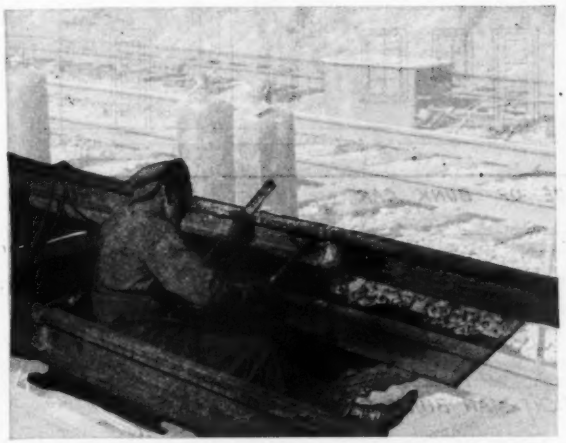
MANY urgent railroad maintenance problems are being solved quickly and economically by Airco's modern metal-working processes. For example, Airco re-building methods swiftly restore battered rail ends, worn switch points and frogs to excellent condition, at surprisingly low cost and with minimum interruption to traffic. Other Airco methods simplify maintenance of railroad structures such as stations, bridges, and signal towers, as well as track tools and equipment.

These versatile methods not only save time and cost but, in many cases, they add years to the service life of the equipment or structures. Airco's Applied Engineering Department will gladly give full information or technical aid on any use of these processes. For complete details, write any Airco office or Dept. REM at the New York address.

**Flame Cleaning and Dehydrating** is the fast, efficient method of preparing metal surfaces for painting. It quickly loosens scale and rust to permit their easy removal. The clean warm surface makes paint cling closer, last longer. Note the results in the inset photo. Airco supplies tips for cleaning flat or irregular surfaces.

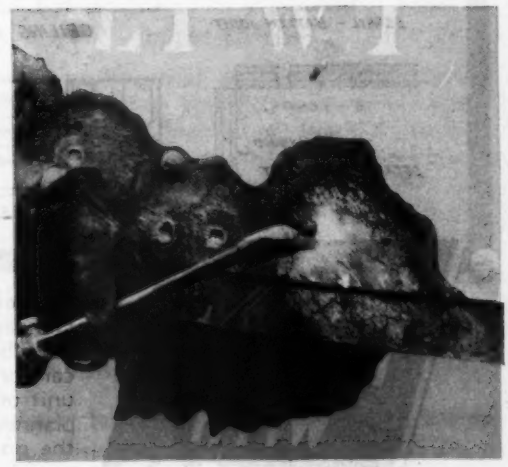
AIRCO

# with Modern Airco Processes



**Butt Welding** by the oxyacetylene method eliminates much of the maintenance necessary on jointed rails. It may be performed either in or out of traffic. This method is economical in application and in maintenance savings.

**Arc Welding** is another Airco process of proven value to maintenance men. Here a reinforcing plate is being welded onto an I-beam with the electric arc.



**Rivet Washing** with Airco oxyacetylene cutting torches is fast and economical. Airco Style 144 tip is used to "wash out" the rivet head, then pierce the rivet shank so that it can be dislodged easily with a rivet hammer.

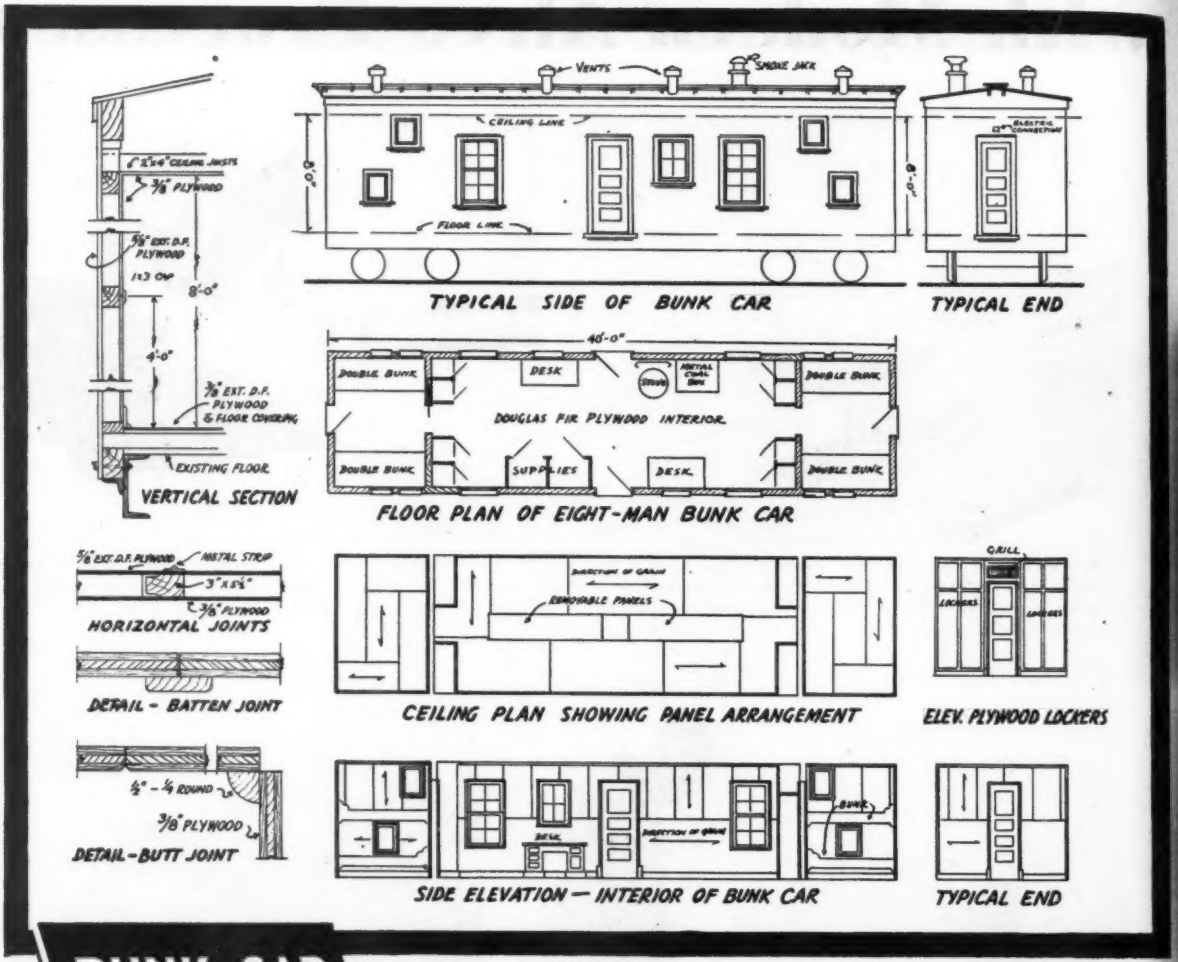
**Crowning Angle Bars** by the use of Airco oxyacetylene heating torches takes the dip out of the bars, raises them to normal position, and thus reduces the length of welding needed to restore a uniform rail end surface.


**AIR REDUCTION**

General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.

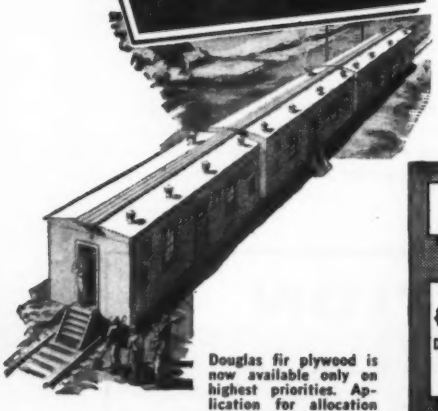
In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON 1, TEXAS

Offices in all Principal Cities




# BUNK CAR REBUILT WITH PLYWOOD

These plans show how a standard 40-foot box car can be rebuilt to provide a bunk car for eight men. This is one unit of a three-car camp train planned especially to utilize the unique advantages of plywood construction. Three standard box cars are easily rebuilt into such a camp-car unit—comprised of bunk car, a diner with full kitchen facilities, and a foreman-shop car. Cars rebuilt with plywood are strong, rigid, durable, easy to heat and free of drafts. The large plywood panels go up quickly, reduce seams and cracks, provide a smooth, easy-to-clean surface. Douglas Fir Plywood Association engineers will be glad to work with you in developing such a unit. Write or wire today.



Douglas fir plywood is now available only on highest priorities. Application for allocation must be made by suppliers to the War Production Board.

**DOUGLAS FIR PLYWOOD ASSOCIATION**
Tacoma 2, Washington

PLYPANEL D.F.P.A.
GENUINE PLYSCORD SHEATHING D.F.P.A.
GENUINE PLYWALL Douglas Fir Plywood WALLBOARD D.F.P.A. INSPECTED
GENUINE DOUGLAS FIR PLYFORM Concrete Form Panel D.F.P.A. INSPECTED
EXT.-D.F.P.A.

DOUGLAS FIR PLYWOOD
LARGE. LIGHT. STRONG.
Real Wood PANELS

**SPECIFY DOUGLAS FIR PLYWOOD BY THESE "GRADE TRADE-MARKS"**

# TOURNAPULL SAVES TIME & MONEY 3 WAYS

### Powering Tournacrane for lifting capacities to 50,000 lbs.

The Tournapull prime mover with its Power Control Unit is used on Tournacrane to give you fast-moving, mobile and powerful crane service to handle railroad heavy-lifting jobs. Big tires, 5'6" in diameter, permit travel along right-of-way, across tracks and yards, off roads, or on-pavement . . . travels and works without tying up rail traffic. No outriggers to set . . . erects poles, towers, tanks, bridge and trestle timbers or steel . . . handles lifts in yards or shop.

### With Carryall Scraper for dirt moving at lowest net cost per yard

Loading, hauling and spreading with 15-yard Carryall Scraper is one of the most profitable railroad uses for high-speed Super C Tournapulls. This job-proved rig moves more yards per hour at lower maintenance cost than any other type of dirt-moving equipment. Can load gravel or ballast from borrow pit or stock pile, spread in place. Outstanding for grade reconstruction, drainage, etc. Digs any material a Rooter can break loose . . . extremely flexible, works off track . . . travel speed loaded or empty 14.9 mph.

### Tournatrailer for hauling shovel and dragline material

The same Tournapull prime mover and LeTourneau PCU can be used with 17-yard rear-dump Tournatrailer. Loaded by shovel from rock banks or draglines in soupy material, Tournatrailer travels at speeds up to 14.9 mph, hauls approximately same capacity as two 6-yard trucks and gets through where trucks can't go in off-road service. Tournatrailer, Scraper and Crane are quickly and easily interchanged on the same Tournapull prime mover. Any combination can be purchased first, any others added later. Send coupon NOW for further information.

**LETOURNEAU**

PEORIA, ILLINOIS · STOCKTON, CALIFORNIA

Manufacturers of Tournapulls*, Angledozers*, Bulldozers, Tiltdozers*, Carryall* Scrapers, Power Control Units, Rooters*, Tournatrailers,* Tournacranes*, Tournatrucks*, Sheep's Foot Rollers, Tournarope*, Tournaweld*, Tournalifts*.

*Trade Mark Reg. U. S. Pat. Off.

To: R. G. LeTOURNEAU, INC., Dept. REM645, Peoria, Ill.

*Send me more information on:*

- ☐ Tournapulls—Folder No. TP-122
- ☐ Complete Line—Catalog No. G-1066

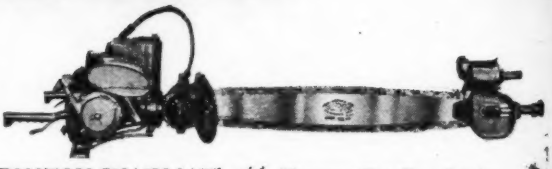
Name _____ Title _____

Company _____

Address _____

RR4

# DISSTON CHAIN SAWS ENABLE ONE CREW TO EQUAL THE WORK OF TWENTY MEN



DISSTON CHAIN SAW *with Mercury Gasoline Engine*
Model G-26—6 H.P. 24" capacity. Model G-36—6 H.P. 36" capacity

DISSTON CHAIN SAW—*Pneumatic*
Model P-27—3½ H.P.; 90 cu. ft. at 90 lbs. pressure, 24" capacity

Wherever there are timbers to cut, work can be speeded up and costs reduced by using Disston Chain Saws—one of the most important developments in saws in years. This is being demonstrated on railroads throughout the country, both on new construction and on maintenance work of many kinds. Heavy timbers are being cut at the rate of an inch a second—a factor of major importance in these days of manpower shortage.

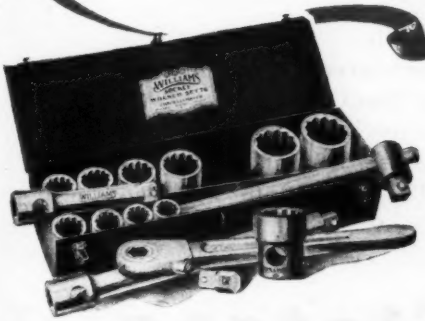
There are two types of Disston Chain Saws: with Mercury Gasoline Engine; and with pneumatic drive. The one is self-contained, and can be taken wherever a man can walk; the other requires a compressor, but has the added advantage of being able to operate under water.

Disston Chain Saws are of extra sturdy construction. They are light in weight, easy to operate, and require no previous experience. They are designed for both horizontal and vertical cutting, and can be used successfully on woods of all degrees of hardness.

Disston Chain Saws are *available now*. Write for full particulars.

**HENRY DISSTON & SONS, INC., 641 Tacony, Philadelphia 35, Pa., U. S. A.**

# *Action and Power* with "SUPERSOCKETS"



● When you want *action* and the safety of sure-gripping *power*, you can't beat Williams "Supersockets." These versatile wrenches, with their various combinations of handles, parts and socket types, provide greater speed even under adverse working conditions.

Williams "Supersockets" are available in 5 different patterns, with drives ranging from 1/4" to 1" square. Socket openings range from 3/16" to 2-3/4". Sold by Industrial Distributors everywhere.

J. H. WILLIAMS & CO., Buffalo 7, N. Y.

WILLIAMS

DROP-FORGINGS AND DROP-FORGED TOOLS

# RIGHT... for Right-of-way Work!

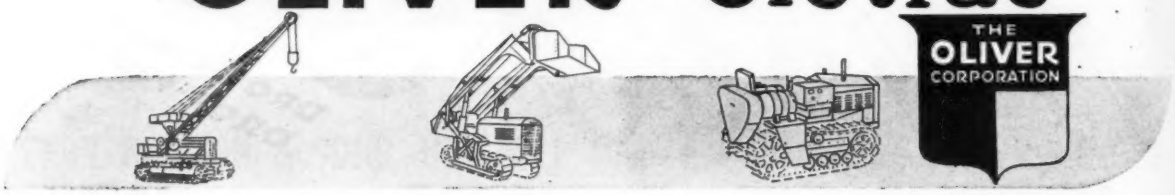
No matter what your maintenance of way work involves . . . tie-tamping, ditch cleaning, building embankments, welding rail ends, cutting light grades, removing snow, sand or gravel . . . an Oliver "Cletrac" crawler tractor can help you cut maintenance costs.

Equipped with a bulldozer, front-end loader, welder, air compressor or other types of auxiliary equipment, an Oliver "Cletrac" works "off-track" . . . does not disrupt rail traffic. Its sure-footed grousers permit it to climb over rails and to operate efficiently on muddy or icy ground. It is not dependent on tracks and needs no derailing.

Replacement of obsolete material is an easy task with Oliver "Cletracs." Simply yank off the outmoded compressor, welder, etc., and install a new one. The rugged construction of these husky tractors assures years of dependable, economical service. Exceptional accessibility makes maintenance simple. And the patented *controlled differential steering* found only on Oliver "Cletracs" keeps power on both tracks at all times . . . assures greater safety on turns and slopes, plus ease of control.

Investigate Oliver "Cletracs" for your jobs. Substantial numbers are now being released for essential use. Your Oliver "Cletrac" dealer will gladly assist you in making application for a new tractor. **The OLIVER Corporation,** Industrial Division, 19300 Euclid Avenue, Cleveland, Ohio.

**OLIVER - Cletrac**



FAIRBANKS-MORSE MOTOR CARS

"First on the rails and still first"

SHEFFIELD MOTOR CAR No. 53

A sturdy lightweight Section Car—only 930 pounds. Room for eight men, with tools, yet one man can handle it. Rear-lifting weight is only 130 pounds. Used in large numbers by some of the best railroads in America. Safe, economical, and versatile. Chain drive, 8- to 13-hp. motor. For details on this or other Fairbanks-Morse Motor Cars write Fairbanks, Morse & Co., Fairbanks-Morse Building, Chicago 5, Illinois.

Fairbanks-Morse

*A name worth remembering*

Diesel Locomotives • Diesel Engines • Generators • Motors • Pumps
Scales • Magnetos • Railroad Motor Cars, Standpipes, and Coaling Stations

# DESIGNED FOR DIESEL POWER...from the rails up!

● *You can choose whatever power you prefer when you buy an American locomotive crane—Diesel, Diesel-electric, gasoline or steam—and expect top performance efficiency. Each type has been designed, from the rails up, to fit the requirements of its particular power plant.*

America's Diesel-powered locomotive cranes are *not* mere adaptations of its steam-powered cranes—there are *no* interchangeable parts between the two. The transmissions and braking mechanisms of American Diesel locomotive cranes have been engineered to fully provide the shock-absorbing and braking actions supplied by the steam engine.

As a result, maintenance is reduced and power application, control, availability and performance are all improved. Have an American field engineer call and explain these important design differences in detail. Write today.

**AMERICAN** MATERIALS HANDLING *for* EVERY INDUSTRY

**AMERICAN HOIST & DERRICK CO.**

*Saint Paul 1, Minnesota*

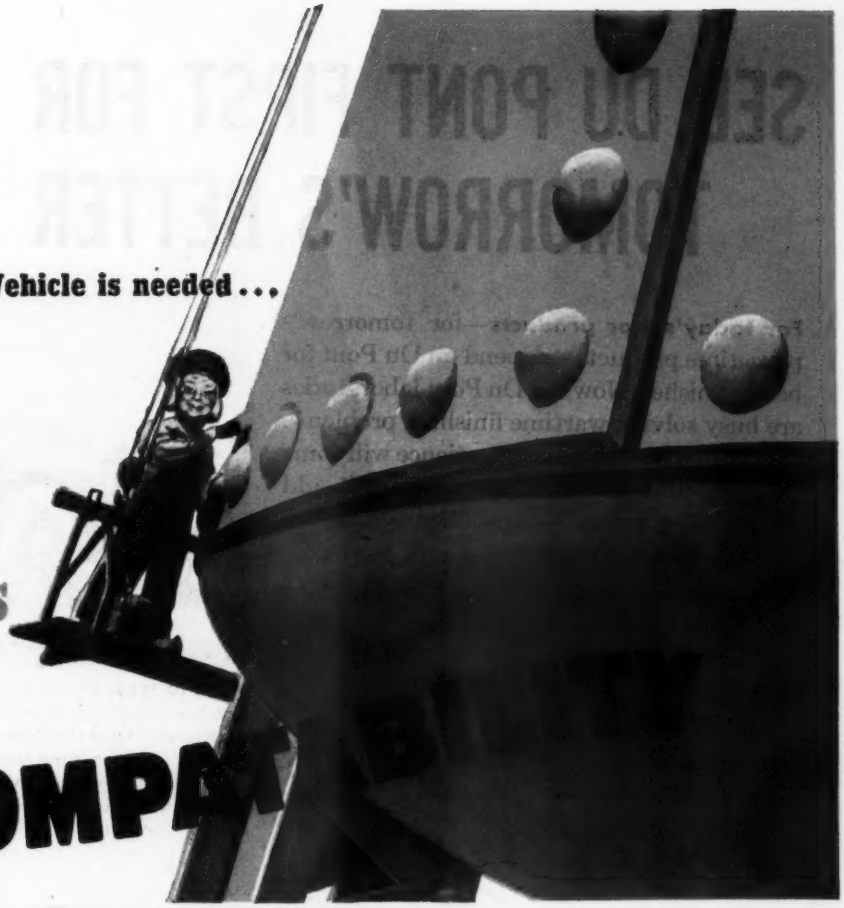
CHICAGO SAN FRANCISCO NEW YORK

*Wherever wire rope is fastened . . . . use genuine* **CROSBY CLIPS** *with the Red-U-Bolt*

**No matter what Paint Vehicle is needed . . .**

- SYNTHETIC RESINS
- NATURAL RESINS
- MODIFIED SYNTHETICS
- DRYING OILS

# RED LEAD'S WIDE COMPA



## makes its Extra Rust Protection Available

The fact that Red Lead is generally accepted throughout industry as the standard metal protective paint indicates two things:

1. *That it must be widely adaptable to various service conditions.*
2. *That it must offer something* EXTRA *in the way of rust prevention.*

Red Lead's versatility is due principally to its compatability with the wide range of vehicles needed to answer present-day service demands. It can be used with practically every type of paint vehicle on the market—synthetic resins, natural resins, drying oils, and combinations of these.

Thus, paints for any metal protective purpose can be formulated with Red Lead. Since almost any paint vehicle can be used with Red Lead, a broad range of drying requirements can be met—anything from the normal drying primer used on structural steel to the quick-drying paint essential to present-day production schedules.

**Why Red Lead means Extra Rust Protection**

Red Lead has the property of counteracting acid conditions, recognized as accelerators of rust. In the presence of various acids, Red Lead forms insoluble lead salts at the approximate rate at which the acids are supplied.

This is true whether the acid originates from acid-forming environments, such as gas, smoke and moisture in the atmosphere, or from the decomposition of the vehicle. Thus, a rust-inhibiting condition is maintained with a Red Lead paint.

Red Lead also forms an adherent protective shield which prevents electrochemical action, another prime cause of rusting.

**Specify RED LEAD for All Metal Protective Paints**

The value of Red Lead as a rust preventive is most fully realized in a metal paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint.

No matter what price you pay, you'll get a better paint for surface protection of metal, if it contains Red Lead.

**Write for New Booklet**—"Red Lead in Corrosion Resistant Paints" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas—ranging from Red Lead-Linseed Oil paints to Red Lead-Mixed Pigment-Varnish types. If you haven't received your copy, address nearest branch listed below.

* * *

*All types of metal protective paints are constantly being tested at National Lead's many proving grounds. The benefit of our extensive experience with paints for both underwater and atmospheric use is available through our technical staff.*

**NATIONAL LEAD COMPANY:** New York 6, Buffalo 3, Chicago 80, Cincinnati 3, Cleveland 13, St. Louis 1, San Francisco 10, Boston 6 (National-Boston Lead Co.); Pittsburgh 30 (National Lead & Oil Co. of Penna.); Philadelphia 7 (John T. Lewis & Bros. Co.); Charleston, W. Va. (Evans Lead Division).

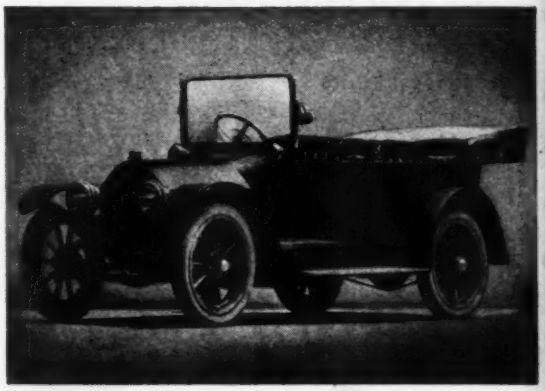
**DUTCH BOY RED LEAD**

# SEE DU PONT FIRST FOR TOMORROW'S BETTER FINISHES

**For today's war products**—for tomorrow's peacetime products—depend on Du Pont for better finishes. Now the Du Pont laboratories are busy solving wartime finishing problems. Out of this research and experience will come the new and better finishes that will add color—sales appeal—durability—value—to everything you make.

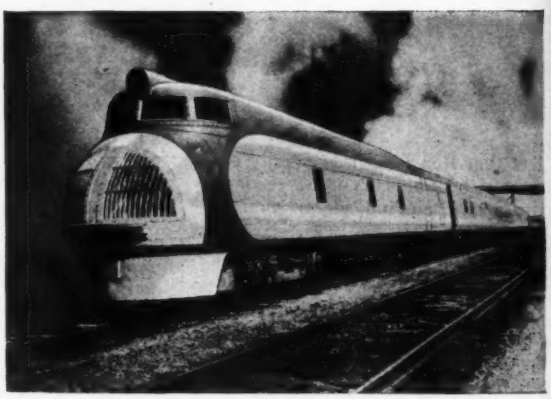
Right now, war needs come first. Du Pont has helped hundreds of industries break finishing bottlenecks—will be glad to help solve your wartime finishing problems.

Call on us, too, if you are planning a new and better product for a brighter tomorrow—provided, of course, it doesn't interfere with the war effort.



**PRIOR TO 1923,** it took 21 days to apply the slow-drying finishes before this four-cylinder powerhouse was ready for market. Then Du Pont perfected DUCO, slashing costs, cutting finishing time from weeks to hours, helping to make production-line finishing possible. From the same laboratories that produced DUCO will come the better finishes for your product of tomorrow.

**IMPROVED FINISHING TECHNIQUES**—For example, a war contractor of metal panels called in a Du Pont Service Engineer when finishing costs hit 50 per cent above estimate. Spray-gun operators were instructed in new technique of applying finish. Results: Finishing materials saved, rejects minimized, costs brought within estimate. Can you use this experience today?



**MANY RAILROADS HAVE STREAMLINED** their finishing problems by calling in a Du Pont Paint Engineer. Reason? Years of experience and know-how in formulating finishes for special requirements have made Du Pont a leader in the field. Write:
E. I. du Pont de Nemours & Co. (Inc.), Finishes Division, Wilmington 98, Delaware.

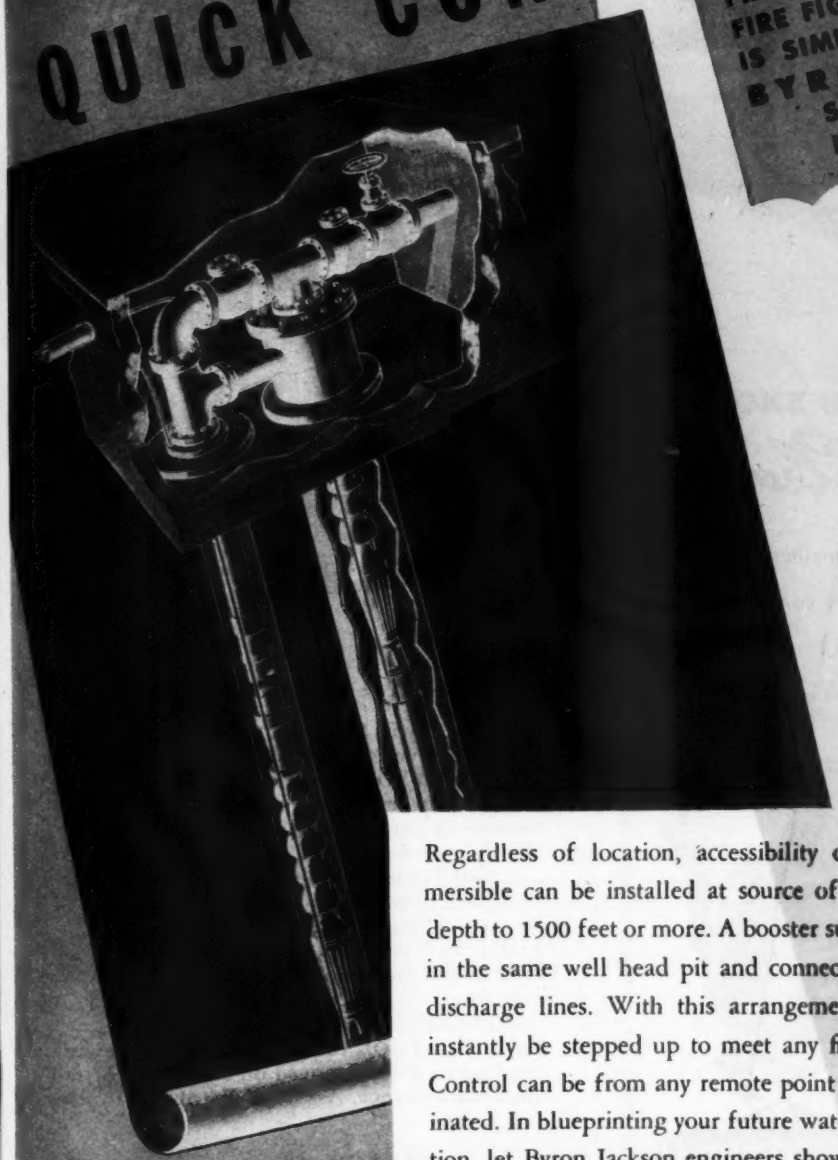
**DEPEND ON DU PONT FOR BETTER FINISHES**

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

# QUICK CONVERSION

FROM SUPPLY MAIN TO FIRE FIGHTING PRESSURES IS SIMPLE . . . WITH THIS BYRON JACKSON SUBMERSIBLE INSTALLATION

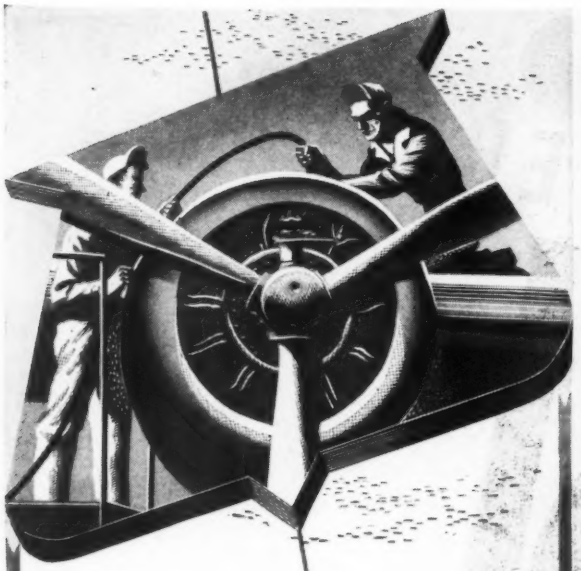


Available in sizes from 5 to 350 hp and for wells as small in diameter as 8 inches, both the motor and pumping element are totally submerged. Motor is connected with surface power lines by an armored marine type cable.

Regardless of location, accessibility or surroundings, a submersible can be installed at source of best supply and at any depth to 1500 feet or more. A booster submersible is then placed in the same well head pit and connected directly to the same discharge lines. With this arrangement supply pressures can instantly be stepped up to meet any fire fighting requirement. Control can be from any remote point and attendants are eliminated. In blueprinting your future water supply and fire protection, let Byron Jackson engineers show you how profitably the submersible can be used.

**BYRON JACKSON CO.**

Houston • LOS ANGELES • New York

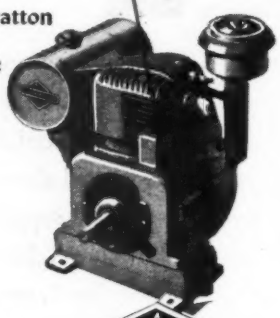


MAKING BOMBER ENGINES

"Come Clean"

To help keep huge bomber engines clean and free of dust and dirt, portable compressed air units are used—powered by these dependable *air-cooled* gasoline engines.

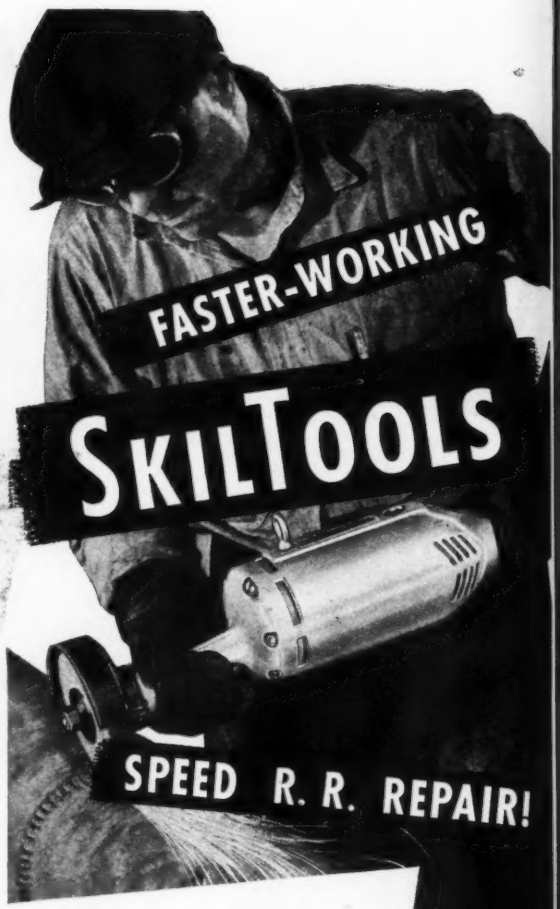
One more vital war job for performance-proved Briggs & Stratton air-cooled gasoline engines.



*Air-Cooled Power* 4 CYCLE BRIGGS & STRATTON GASOLINE ENGINES

Their trouble-free performance, easy starting and economy have made Briggs & Stratton engines leaders in the field—"preferred power" everywhere. Only in Briggs & Stratton AIR-COOLED POWER can you get the superior performance made possible by the "know-how" gained through 25 years of continuous production, and consistent leadership in design, engineering, and precision manufacture.

BRIGGS & STRATTON CORPORATION
Milwaukee 1, Wisconsin, U. S. A.



● Wheel Type SKILGRINDER shown above is only one of many SKILTOOLS that are stepping up repair and maintenance in car shops and on the right-of-way.

SKILTOOLS are better-designed, better-built to stay on the job longer, to handle easier and enable fewer men to get more done in less time.

There's a quality-built SKILTOOL for every drilling, sawing, sanding or grinding need on every type of railroad maintenance. Ask your distributor to show you today!

SKILSAW, INC.
5033-43 Elston Ave., Chicago 30, Ill.
*Factory Branches in All Principal Cities*

PORTABLE ELECTRIC
SKILTOOLS
MADE BY SKILSAW, INC.

# PRESSURE-TREATED WOOD

## passes the "ACID TEST" in this roof

Many manufacturing and process operations generate fumes that attack and destroy walls and roofs. To avoid continuous maintenance, the designer must find a material that can "take it." Pressure-treated wood is a possibility that should always be considered, because it provides the easiest, most effective, and most economical solution in so many cases.

In the installation pictured, the fumes create a moist condition on the under surface of the roof. The moisture absorbs sulfur and boric acid compounds in the fumes, making a weak acid condensate. As the illustration shows, the metal roof beams have been badly attacked, the wood roof-deck—pressure-treated with chromated zinc chloride for fire resistance and protection against decay and insect attack—is still serving with no visible damage.

Pressure-treated wood is helping engineers build all types of structures faster, at lower cost, and with less maintenance. A variety of treatments are available, to protect against decay, termites, and marine borers, and to provide fire-resistant properties. You will find these treatments described, and a number of applications illustrated, in our bulletin, "Economical and Permanent Construction with Pressure-Treated Wood." We will gladly send you a copy on request.

*For complete specifications, refer to your Sweet's 1945 Catalog . . . or write us.*

**KOPPERS COMPANY, INC.—WOOD PRESERVING DIVISION**

**PITTSBURGH 19, PA.**

**KOPPERS**

*Buy War Bonds— and Keep Them!*

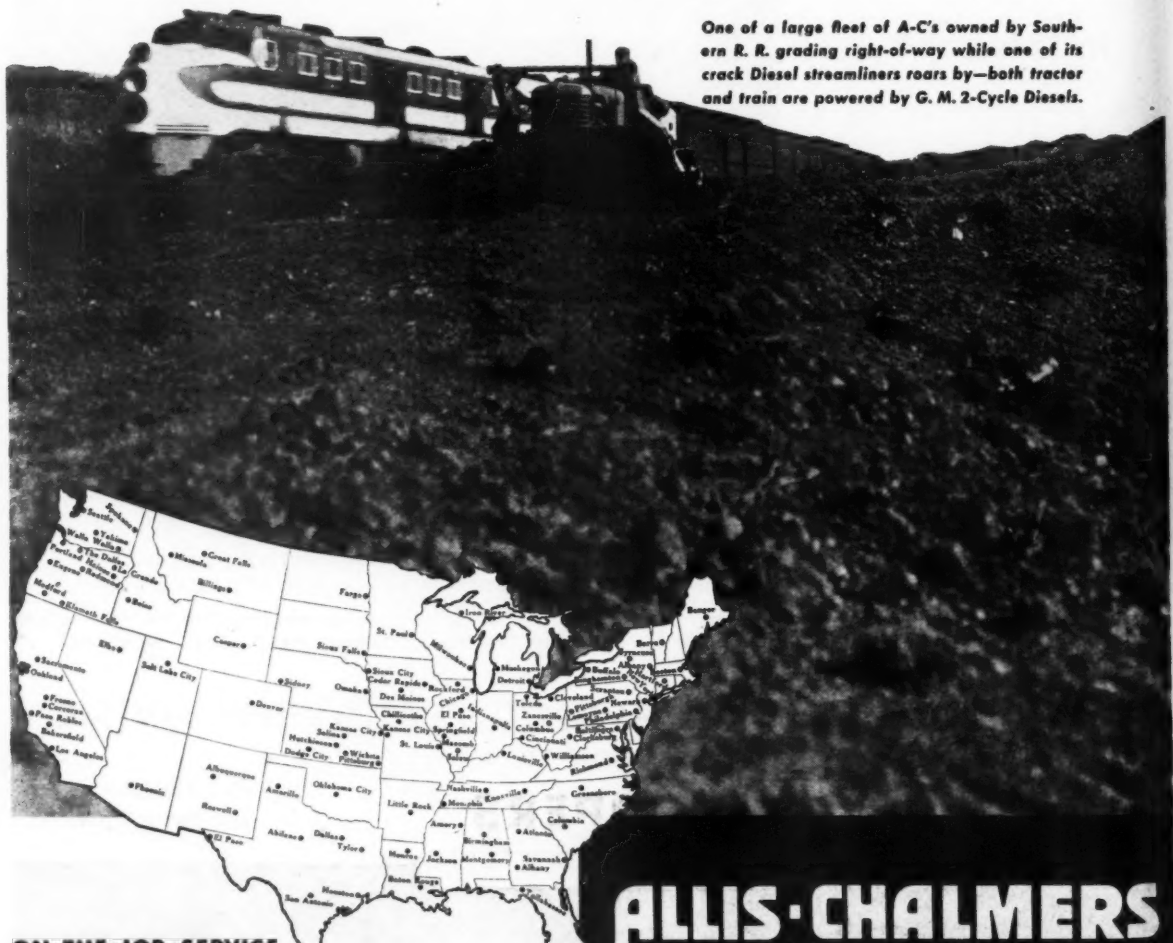
THE INDUSTRY THAT SERVES ALL INDUSTRY

# Matched Performance

**Match streamlined service with streamlined maintenance! Use powerful Allis-Chalmers tractors, with auxiliary equipment, to keep rights-of-way in tip-top condition. Smooth-operating, fast-working 2-cycle Diesel tractors handle ditching, sloping and other grading safely, without interference to traffic . . . do better work at less cost. Flexible, they operate close to or far from the tracks . . . anywhere! Are quickly transported from one job to another.**

**Backed by skilled dealers throughout the country, Allis-Chalmers tractors are quickly serviced, night or day. Highly trained mechanics with genuine parts and modern shop facilities are as close as your phone. Service trucks equipped with portable tools permit field repairs if necessary.**

**It will pay you to investigate the many EXTRA advantages 2-cycle Diesel tractors provide. Get all the facts from your Allis-Chalmers dealer.**



*One of a large fleet of A-C's owned by Southern R. R. grading right-of-way while one of its crack Diesel streamliners roars by—both tractor and train are powered by G. M. 2-Cycle Diesels.*

**ON-THE-JOB SERVICE**

**Near you is an Allis-Chalmers dealer ready to provide A-1 service—locations indicated on map.**

**ALLIS-CHALMERS**

TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

# Exclusive with

# JACKSON Tampers

## The VIBRATORY Action

The blow of the Jackson Universal Tie Tamper is not percussive or in one direction only, as is usual in other mechanical picks or tampers. Since the vibratory action is produced by an unbalanced weight mounted on a shaft revolving at high speed, a very powerful forward and downward tamping blow is obtained, which is followed by two sidewise vibratory actions. The latter keep the surrounding ballast in constant motion, feed the ballast to the end of the blade and prevent ballast particles from wedging underneath the tie.

Obviously this action promotes faster, better, more efficient tamping — which in a large measure accounts for the fact that JACKSON Tampers are preferred by the majority of America's leading railroads.

**IDEALLY ADAPTABLE TO EVERY LIFT AND BALLAST!**

JACKSON Vibratory Tampers are available with quickly interchangeable blades which provide for peak efficiency in each and every operation in which tampers are used. Write for literature describing JACKSON Vibratory Tampers and how to use them.

**ELECTRIC TAMPER & EQUIPMENT CO., LUDINGTON, MICH.**

No. 198 of a series


# Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO 3, ILL.


Subject: "Beer" or the "Froth"

Dear Readers: June 1, 1945

In my letter to you last month, I told you that Railway Engineering and Maintenance had been criticized by a reader who purported to reflect the viewpoint of many, "because it was poorly and inadequately illustrated"—and I appealed to you for your opinion, and especially as to whether you preferred more and larger illustrations at the necessary sacrifice of details in the text. If the opinions of 20 readers, from chief engineers to track supervisors, can be construed as constituting a representative answer, here it is in the form of brief abstracts from a number of these letters, which reflect the feeling expressed at length in every one of them:

"I think that you have always done a fine job, both in the use of illustrations and in the written material."—Engineer M. of W.—System.

"I think you have done a fine job in balancing illustrations and text."—Assistant Bridge Engineer—System.

"We do not share the criticism with respect to lack of illustrations in Railway Engineering and Maintenance. The articles in your publication have always been satisfactorily illustrated."—Chief Engineer.

"I would not agree to the sacrifice of important information and details to make room for pictures."—Supervisor Bridges and Buildings.

"I see no reason for anyone commenting upon the lack of illustrations in your publication."—Engineer of Track.

"In my judgment, Railway Engineering and Maintenance is not open to criticism because its pages do not contain more and larger illustrations. I think you have maintained a very excellent balance."—Chief Engineer.

"Maintenance has not impressed me as being lacking in illustrations. In fact, as a rule, it seems pretty well balanced."—Consulting Engineer.

"Generally speaking, I would not want Railway Engineering and Maintenance to become a pictorial magazine."—Engineer of Track.

"In my opinion, the articles presented in this publication have enough illustrations to help the reader visualize readily the methods and situations described."—Engineer Bridges and Buildings.

"Generally, the articles published in this magazine are well and sufficiently illustrated.—I don't think anything would be gained by the profuse use of illustrations."—Supervisor of Structures.

"In my opinion, you have maintained very good balance between these objectives, and I would think that no change should be made until the paper supply materially increases."—Principal Assistant Engineer.

"I have generally found the articles good examples of descriptions of certain methods of work, with the illustrations showing just the proper fundamental phases."—Supervisor of Track.

"Your magazines are not 'pictorial'. They are designed for the purpose of giving us information which cannot be provided alone by pictures.—You have done a very good job in the balancing of illustrations and text. To resort to your own language, I would say that we want the 'beer' with just enough 'froth' so that it will not appear stale."—Assistant Chief Engineer.

We are convinced that the foregoing statements from you readers vindicate our past efforts to balance text and illustrations, and that they should be guide posts for our future policy. At the same time, we are far from satisfied with our efforts to date and shall continue unceasingly to bring to you each month a magazine of maximum interest and benefit—adequately illustrated.

Sincerely,

Neal D. Howard

NDH:JB Editor.


MEMBERS: AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

# RMC RAIL JOINT PACKING

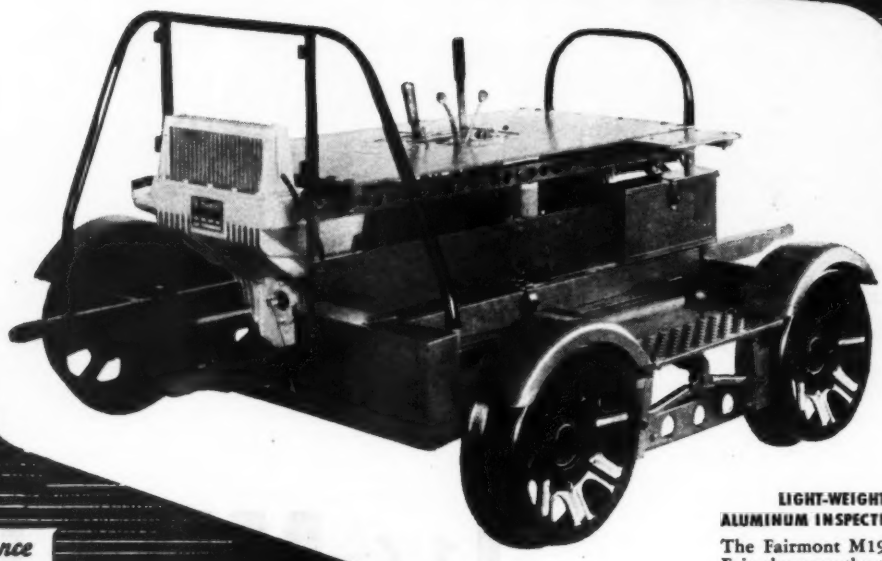
*Over*

## 1½ MILLION

***rail joints packed in main line track in 1944!***

**RAILWAY MAINTENANCE CORP.**
**PITTSBURGH 30, PENNSYLVANIA**

# TELL THE STORY



Performance
ON THE JOB
COUNTS

**LIGHT-WEIGHT ALUMINUM INSPECTION CAR**

The Fairmont M19 Series E is the smoothest riding car in its class. Lifting weight only 98 lbs.

The story of performance is soon told. The popular demand of the men who handle inspection work is for the Fairmont M19 . . . just about the highest tribute that could be paid to its performance. This car is light in weight, big in power, smooth in riding, and compactly comfortable for one man or a crew of four . . . with plenty of space for tools. Its performance is so much a matter of record that its dependability is taken for granted.

But behind the strong preference for the M19 is the knowledge that it has the basic simplicity of all Fairmont cars. Aluminum construction provides strength with light weight—it is spring mounted for riding comfort and the Fairmont Roller Bearing Water-Cooled Engine provides a reserve of power for all conditions. Bulletin 396 tells the complete story. Fairmont Railway Motors, Inc., Fairmont, Minnesota.

**OF ALL THE CARS IN SERVICE TODAY . . . *MORE THAN HALF ARE FAIRMONT***

# Fairmont
## RAILWAY MOTOR CARS

*"Civilization Follows Transportation," authentically illustrated in color by Walter Haskell Hinton, will be mailed free. Send us your name and railroad address.*

# Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

June, 1945

**Editorials** - - - - - - - - - - - - - - - - - 571
On to Japan—Slide Control—Timber Treatment

**Rhine Bridge, 1,752 Ft. Long, Built in Ten Days** - - - - - - 574
Capt. E. J. Phillips gives details of the manner in which Army Engineers threw the first railroad span across the last "barrier" before Berlin

**Southern Pacific Controls Slides With Tunnels** - - - - - - 578
Describe how this method of stabilizing hillsides has been developed to a high state of perfection as a result of 30 years of experience and study

**Terminal Maintenance** - - - - - - - - - - - - - 582
Organization, methods and equipment are described in final report on this subject by a committee of the A.R.E.A.

**New Tools for Rail Laying** - - - - - - - - - - - - 585
E. L. Banion describes a number of devices that have been recently introduced for this purpose to promote better, faster work

**Maintenance of Pipe Lines** - - - - - - - - - - - - 587
No. 12 of the water service series discusses the classes of pipe in common use and such matters as leaks, joints and water hammer

**Foreman Fails to Flag** - - - - - - - - - - - - - 591
Lack of proper protection when repairing the track causes derailment on the Northern Pacific that resulted in 106 persons being injured

**What's the Answer?** - - - - - - - - - - - - - 592
Preparing for the Rail Gang
Can Ties Be Tamped Too Solidly?
Should Piles Be Seasoned?
Water for Diesel Locomotives
Dimensions for Tamping Bars
Sending Out a Flag
Painting Enginehouse Walls
Painting Galvanized Gutters

**Products of Manufacturers** - - - - - - - - - - - - 599

**News of the Month** - - - - - - - - - - - - - 600

**Published on the first day of each month by the**

**SIMMONS-BOARDMAN PUBLISHING CORPORATION**

**105 West Adams St., Chicago 3**

New York 7, 30 Church Street

Cleveland 13, Terminal Tower

Washington, D.C., 4, 1081 National Press Bldg.

Seattle 1, 1033 Henry Bldg.

San Francisco 4, 300 Montgomery St.

Los Angeles 14, 530 West 6th St.

Samuel O. Dunn, *Chairman of the Board;* Henry Lee, *President;* Roy V. Wright, *Vice-President and Secretary;* Frederick H. Thompson, *Vice-President;* F. C. Koch, *Vice-President;* H. A. Morrison, *Vice-President;* Robert E. Thayer, *Vice-President;* J. G. Lyne, *Vice-President;* H. E. McCandless, *Vice-President;* John T. DeMott, *Treasurer.*

Subscription price in the United States and Possessions and Canada, 1 year $2, 2 years $3; foreign countries, 1 year $3, 2 years $5. Single copies, 35 cents each. Address H. E. McCandless, Circulation Manager, 30 Church Street, New York 7, N.Y.

Member of the Associated Business Papers (A.B.P.) and of the Audit Bureau of Circulations (A.B.C.).

PRINTED IN U.S.A.

NEAL D. HOWARD
*Editor*

MERWIN H. DICK
*Managing Editor*

JOHN S. VREELAND
*Eastern Editor*

GEORGE E. BOYD
*Associate Editor*

CHARLES C. ROBINSON
*Associate Editor*

GEORGE H. PARIS
*Associate Editor*

S. WAYNE HICKEY
*Business Manager*

## YOU CAN HAVE AN INDEX

Because of the paper shortage no index for 1944 has been issued except to subscribers who ask for it. If you desire a copy of the index please send in the coupon below.

**Circulation Manager**
**Railway Engineering and Maintenance**
**30 Church St., New York 7, N. Y.**
Please send index to address below

Name ..................................................

Street ..................................................

City ..................................................

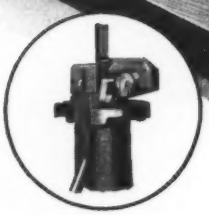
# RACOR SWITCH POINT LOCK...

## provides extra, *independent* protection

FIGURE 3911
For use with Column Throw Switch Stands

The Racor Switch Point Lock gives important additional protection at switches. Should any part of a throwing mechanism fail to function or be damaged from some outside cause, switch point is held in closed position. Not only is the Racor Switch Point Lock independent of the switch stand, but it is located below the top of the tie where it is protected. There are two main types of Racor Switch Point Locks, Figure 3911 for Column Throw Switch Stands and Figure 3912 for Ground Throw Switch Stands. With either lock, a sturdily-constructed lock rod clamps the switch point firmly against the stock rail.

*For additional information on the Racor Switch Point Lock . . . how it works . . . how to order . . . how to install . . . write for illustrated booklet containing photographs, diagrams and specific, detailed description.*



Eversure Lock — furnished when specified.

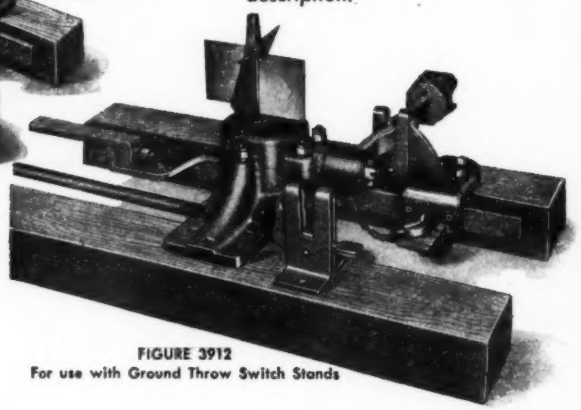


FIGURE 3912
For use with Ground Throw Switch Stands

**Brake Shoe**

**RAMAPO AJAX DIVISION**
**332 South Michigan Ave., Chicago 4, Illinois**

Hillburn, N. Y.
Superior, Wisconsin
Niagara Falls, N. Y.
Los Angeles, California
Pueblo, Colo.
New York, N. Y.
Seattle, Washington
East St. Louis, Ill.
Niagara Falls, Ontario

Railway Engineering and Maintenance

# *On To Japan—*

## The Slogan of Every Railroad Man

V-E Day, May 8, 1945, will be a memorable day in the history of our country. For their part in bringing this day to pass, the American railroads can take justifiable pride, a pride that can be shared by every employee who has done his job faithfully during the last long three and one-half years. But the really big day for America is still ahead—V-J Day.

Until V-E Day, the war effort of our country was necessarily divided. Figuratively speaking, our strategy was to hold up our guard against one enemy in the Western Pacific while we beat into subjection the "super men" in Europe. Now, with Germany on its knees, our full and undivided effort can and will be turned to the West until the infamy of December 7, 1941, is recompensed and the treacherous military might of the Japanese is brought to bay.

In the task that lies before us, the railroads will have a tremendous part —a vitally essential part. Without adequate railroads, we would still be looking ahead to V-E Day. Indeed, without such railroads, that day might well have never come. Hitler dared to challenge the United States in part because he was convinced that the "decrepit" American railroads would break down under a war load. In his belief, he was not alone. But in their calculations, both Hitler and those others who so depreciated the American railroads overlooked the latent power of the industry which, more than any other, has made and kept America great.

How the railroads met the challenge of the war in Europe, both on the home front and, through the Military Railway Service, in every theater of military operations, is a record of glorious achievement. At home, those "decrepit" railroads have carried a freight traffic twice as large as in 1940, and passenger traffic more than four times that of four years ago. This they have done with far from an adequate number of cars and locomotives, and with shortages in man-power that have exceeded 100,000 men in all departments. This they have accomplished in spite of the strain of some of the most severe flood and winter conditions that have ever prevailed in parts of the country, and despite the constant shortage of many essential materials for necessary construction and maintenance.

But now all eyes are turned to the West. Unlike Hitler, the Japanese should have no illusions about the ability of the American railroads to do the job that confronts them. For years, its military emissaries, in the guise of students and railway officers, studied, photographed and collected plans of vital railway installations throughout the country—too often with the assistance of unsuspecting American railway men acting in the spirit of good will. Then, the Japs were observing the facilities. Now they will witness how these facilities can be operated to peak capacity—with loaded traffic predominantly westbound. And in this operation, the railroads will not be hauling scrap metal to Japan for its war machine. This time it will be the real thing—the finished products of our munition plants—millions of tons of them—that will blast from the Japanese everything they have stolen over the years.

That these goods be delivered, and on time, is the challenge presented to American railway men. Their record in World War II will be acclaimed not by what they accomplished to V-E Day or to date, but by what they accomplish tomorrow, next week, next month, and until V-J Day brings final victory. Then and only then, having accomplished successfully the greatest task that has ever confronted them, can they say that their war job is done. Until then, the slogan of every employee must be, "On to Japan".

# Slide Control—

## Drainage Tunnels Warrant Careful Consideration

SLIDING hillsides constitute a problem that has long troubled railroad engineering departments. At any given time nearly every railroad has one or more locations on its lines where difficulties are being experienced in the form of a sliding overburden. Most frequently the unstable area is located uphill from the track, with a tendency to encroach on railroad property, but in many instances the material directly underneath the roadbed is involved, with the result that both the line and surface of the track may be affected.

Wherever a slide is encountered it is almost certain that water is a basic causative factor. The presence of water not only contributes to the instability of the moving material but, if present on the cleavage plane, it will accelerate movement by acting as a lubricant. That water is generally the culprit to be dealt with has long been recognized, but the proper cure in any specific instance is not always as apparent as the diagnosis. Where only a small area is involved the problem is not so difficult, but frequently the area of movement may encompass an entire hillside, possibly including an acre or more of land, in which event effective control becomes exceedingly difficult.

Control measures that have been employed in attempts to stabilize slides have taken the form of many different expedients, ranging all the way from diversion ditches to dispose of surface water to the drilling of drainage tunnels for handling the sub-surface water. While drainage tunnels have been used for many years by certain roads they do not constitute a common expedient, perhaps for the reason that on many roads instances calling for their use occur only infrequently, with the result that no clearly-defined technique for applying them has been developed.

Admittedly, the drainage tunnel as a control measure for slides is comparable to major surgery, but it is equally true that in many instances it is the only means capable of achieving any great degree of success. At least this has been the experience of the Southern Pacific, Pacific Lines, on which, as described in a feature article in this issue, such tunnels have been in use for more than 30 years. This road has hundreds of miles of lines in mountainous country where slides are a relatively common occurrence, and as a measure of self preservation the company has become highly adept in the application of effective methods of control. That it is continuing to rely heavily on drainage tunnels for this purpose speaks well for the efficacy of this expedient.

Not only has the Southern Pacific had many years of experience with drainage tunnels but it has made a careful study of all the considerations involved in applying them effectively. Thus, the success with which this road is using such tunnels can doubtless be attributed to the combination of long experience and close study, out of which has grown a highly specialized mode of procedure that takes advantage of all the knowledge that has been gained in locating, designing and drilling drainage tunnels ranging from 50 ft. to 1,200 ft. in length at approximately 83 separate locations.

In some sections of the country the spring season that is now coming to an end is one of the wettest on record. Under such conditions it is inevitable that slides should occur with increasing frequency. It is for this reason that maintenance and engineering officers on roads afflicted with slide trouble may do well to review the practices of the Southern Pacific with the thought that some of them may be found useful in coping with their own problems of this nature.

# Treated Timber—

## Causes of Failure Can Be Eliminated

IN a discussion of the seasoning of piles after treatment, which appears on a later page of this issue, certain types of failures in piles are mentioned. In the early days of wood preservation there were numerous failures of treated timber, often from apparently obscure causes which remained a mystery for a long time. Fortunately, however, practically all of the various types of failures have been traced to their sources and, in general, the conditions that caused them have been corrected. Correction of these defects in treating practices has enabled engineers in both the railway and other fields to use treated wood as a dependable structural material for a wide variety of applications.

However, development of better treating practices did not bring immunity from failures. In fact, failures continued to be almost as numerous as at first. Paradoxically, for many years, the most common cause of failures in treated wood was decay, the very thing that preservative treatment is intended to prevent, or at least delay for a long period. Strangely, despite present knowledge of the subject, this cause still persists, although not to the same extent as formerly. However, today, the preservative treatment can seldom be blamed, since the fault can be traced almost invariably to improper handling and abuse of the material between the time of treatment and application, thus enabling decay-producing organisms to get a foothold and to bring about the destruction of the timber prematurely.

Treated timbers are subject to abuse through the use of cant hooks and pike poles; by reason of framing after treatment; from the boring of bolt holes; and, in the case of piles, as a result of cutting them off. If framing or bolt holes are essential to the erection of structural members, the framing and boring should be done prior to treatment. It is no more difficult to frame a timber to fit in a structure or to bore holes so that they will match, prior to treatment, than it is to do the same things with structural steel. The only exceptions to this statement are the cutting off of piles to the proper elevation after they have been driven and the boring of holes in piles and sway braces for timber trestles.

It is seldom desirable and rarely necessary to obtain complete penetration of the timber by the preservative, except in case of pieces having very small dimensions, and of timbers to be used in infested marine waters. In general, therefore, there is an outer zone of completely penetrated wood and a narrow zone that is treated only partially, while the body of the timber contains no preservative. Cant hooks or pike poles may penetrate the treated zone or seasoning cracks may open into the untreated wood. In either event, decay-producing organisms will find an easy entrance to the interior, after which the destruction of the wood is only a matter of time.

Again, bruising the surface of treated timber through carelessness in unloading or in other ways has often shortened the life of timbers that otherwise might have lasted almost indefinitely.

It will be seen from the foregoing that there are numerous causes for the premature failure of treated timber. It should be kept in mind, however, that the correction or elimination of these causes is generally simple, although not always easy. The use of treated timber is surrounded by many adverse conditions. Yet, if suitable precautions are taken in the original preparation of the timber; if only sound, preframed timber is treated; if the handling after treatment and the application of the timber are supervised well and intelligently; the number and types of failures to be expected will be so reduced as to become negligible.

# Let's Look at the Record

## *An Open Letter From*

## BRIG. GEN. CARL R. GRAY, JR.

### Director General, Military Railway Service

A. P. O. 887
24 April 1945

To—The Railroad Men,
Their Families and Friends:

American railroad men who are charged with the safe and on-time delivery of millions of tons of freight each year are fundamentally honest and devoted in their attention to duty. It is their job to see that the receiver of the freight gets it in perfect condition and on time.

I cannot understand how, with their background, members of the 716th Railway Operating Battalion could have strayed so far from the principles which they have always stood for, unless, perchance, the accused were in reality men without railroad experience or background, but simply a cross-section of American citizenship drawn into the Army by induction, a proportionate number of which were assigned to the Military Railway Service units. I just cannot feel a group of railroad men had gone wrong to the extent that the reports from the trials and convictions seemed to indicate.

The railroads of America actually crippled themselves to give us experienced officers and a great many experienced enlisted men. In order to have the necessary railroad experience, most of these officers and men really had to be above Army age. Many of them served in the last war. Now with particular reference to the 716th Railway Operating Battalion, this Battalion is composed of 887 officers and enlisted men; only 349 of these were even questioned and 160 brought to trial, of whom almost one-half had had no railroad background. Those with railroad background who were brought to trial represented only three-tenths of one per cent of the total strength of the Military Railway Service in this theater. Of the twenty-two men tried and acquitted, seveneen had railroad background.

One of the men convicted and sentenced to a long term was from my own home town, St. Paul, and reports from St. Paul indicate that this man was not a railroad man and that he had a police record before he went in the Army. I have not had a chance to check up on the previous record of some of the others, but I do know that it was most unfortunate, and, to me, definitely misleading that the 716th Railway Operating Battalion's name seemed to be used each time there was a conviction in connection with these black market operations, even though the man sentenced did not belong to the 716th Railway Operating Battalion.

I have no brief for a thief, but I have lived among railroad men all my life and know them to be fundamentally honest. The thing that I want the American public to understand is that neither this Battalion nor any of the American railroad men in the 67 units, and over 30,000 men, are thieves. They are conscientious rail transportation men who are as much interested in getting the supplies to the soldiers in the front lines, their consumers, safely and on time, as they ever were back on a commercial railroad in the United States, where their bread and butter depended upon that kind of service.

I have talked to too many of them and they look upon their responsibilities here and to their Big Shippers—the Services of the Army—and their consumers—the Soldiers in the front line trenches—with a higher degree of service standards than they have on the most competitive commercial railroads back home. In the United States their jobs depended upon successful, safe and on-time rail transportation. Over here, they know that their future, the future of their families, the future of their country, in fact, the future of the world, requires the same dependable rail transportation service for the Armies that they have always given the shipping public of the United States. They have given that unstintingly.

They know no 16-hour laws over here. An engineer will work on a track if necessary and a conductor will help build bridges, while the "gandy-dancer" will try to run a locomotive if there is no engineer available. They are not thieves and they are not criminals, but they are American citizens with a pride and a love of their industry and their work, a mature realization of their responsibilities, and a devotion to duty that has been superb. They are pushing forward tens of thousands of tons of freight a day to their comrades in arms, the men of the Armies they are supporting, and I just cannot stand idly by and let an impression go unchallenged that they have so completely forgotten their American railroad standards and principles, as well as their American ideals, as to be guilty in other than a very small degree of the whole black market operations, which fortunately have been nipped in the bud in time.

To the everlasting credit of the 716th Railway Operating Battalion and to the other battalions and units of the Military Railway Service in this theater, all of these men have gone steadily forward in doing their job of railroading for the Armies. Their morale is excellent and the 716th Railway Operating Battalion has just passed a rigid inspection with an excellent rating. The 716th Bulletin of March 24th states, "The end of March is nearly here and still no venereal disease in the 716th." This indicates to me that they are good solid American railroad men, that they still have confidence and faith in themselves, in their unit, in their railroad industry and in America, and will not permit exaggerated and false accusations about them in any way to lessen their attention and adherence to duty, nor "slow them down" in doing their share of moving the freight forward to the Armies.

With kindest regards,

Sincerely yours,

Carl R. Gray Jr.

CARL R. GRAY, Jr.

The Bridge Under Construction, As Seen From the West Bank*

# Rhine River Bridge, Constructed

By CAPT. E. J. PHILLIPS, TC
Second Military Railway Service

**During the last weeks of the war in Europe final victory was hastened by many climactic achievements of the Allied forces, such as the construction of the first railroad bridge across the Rhine river in an incredibly short time. This story of that achievement tells of the considerations that determined the location of the bridge, gives its characteristics and dimensions, and tells how the construction work was organized and prosecuted**

ARMY Engineers, co-operating with the Transportation Corps' Second Military Railway Service, completed the first railroad link across the Rhine on April 8. The connection consisted of a 1,752-ft. single-track bridge over the Rhine river, a 463-ft. bridge spanning a nearby canal, approximately two miles of connecting tracks, and rearrangement and provision of yard facilities at Wesel and Buderich, Germany. Starting construction at 6 p. m. on March 29, and working night and day, Army Engineer troops had the main bridge ready for traffic 10 days, 4 hr. 45 min. later. Twenty-five minutes after the bridge was declared open, the Military Railway Service operated the first train across this last "barrier" to Berlin and moved the train farther to the east for unloading.

Unlike civilian projects of this type, the location of military railroad bridges is often decided upon on short notice, depending upon the developments in the tactical situation. In thinking over the problem before the actual crossing by combat troops, preference had been given to locating the first railroad bridge at Duisburg, Dusseldorf, Cologne or Wesel, with Wesel as fourth choice. It was fully expected that new bridges would have to be built. However, in pushing toward the Rhine, the First Army established the first bridgehead by capturing a railroad bridge near Remagen, south of Cologne, on March 7. Steps were immediately taken to exploit the use of this bridge for railroad traffic by the rehabilitation of railroad lines on the west bank giving access to the bridge.

Then, on March 17, the Remagen span collapsed. Planning by the Transportation Corps railroad staff thereupon reverted to the original blueprints. On March 22 the Third Army crossed the Rhine south of Mainz. The Second British Army crossed the river north of Wesel on March 23 and 24. The Ninth Army moved over the Rhine south of Wesel on March 24, 25 and 26. Then the envelopment around the Ruhr was completed, leaving Duisburg, Dusseldorf and Cologne still in enemy hands, but with American armored columns sweeping rapidly into the heart of Germany. Wesel was therefore chosen as the site of the first railroad crossing of the Rhine.

### Old Bridge Not Used

The matter of deciding on the actual location of the bridge was placed before the Army Engineers at 10 p.m. on March 26. Reconstruction of the old destroyed railroad bridge at Wesel or use of its piers for a new bridge was rejected because of the former

*Photos by Engineering Department, Second Military Railway Service, and Signal Corps.

# 1,752 Ft. Long, in Ten Days

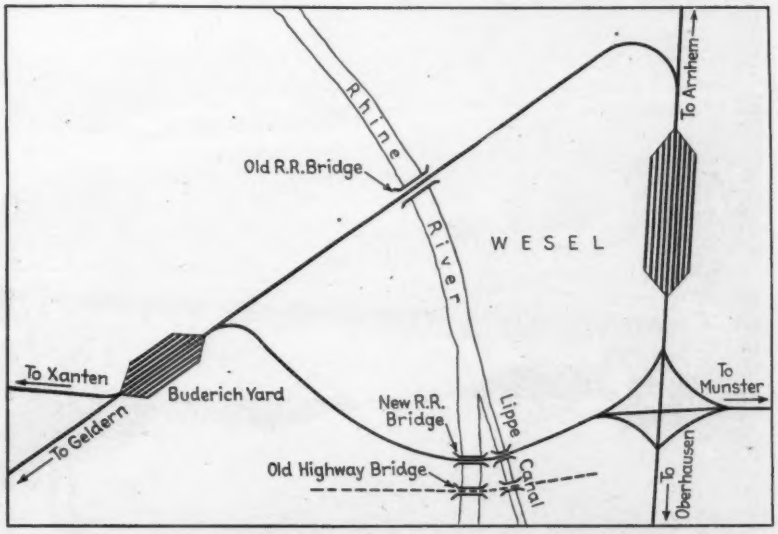
**Top—This View Indicates That the Pile-Driving Work Was Carried on at Several Locations Simultaneously. Demolished Highway Bridge in Background. Right—Close-Up of One of the Piers.**

excessive height and length (3,500 ft.) of this bridge, and the damage it had suffered. The point selected was 1,500 ft. upstream from the old bridge, adjacent to the piers and wreckage of a former highway bridge that the Germans themselves had planned to use as a dual highway and railroad structure. Here, partially completed approach tracks and embankments were available, connections could be made to Wesel yard, some protection from floating debris would be provided by the wreckage of the highway bridge, and an estimated two weeks could be saved as compared to reconstruction at the old railroad bridge site.

### How Forces Were Disposed

With the location of the bridge decided upon, the limits of jurisdiction of the 708th Railway Grand Division were established as the west bank of the Rhine, the 729th Railway Operating Battalion to operate up to Buderich yard. During the construction period, these units co-operated with the Army Engineers in expedit-

*(Continued on next page)*




**Sketch of the Track Layout at the River Crossing**

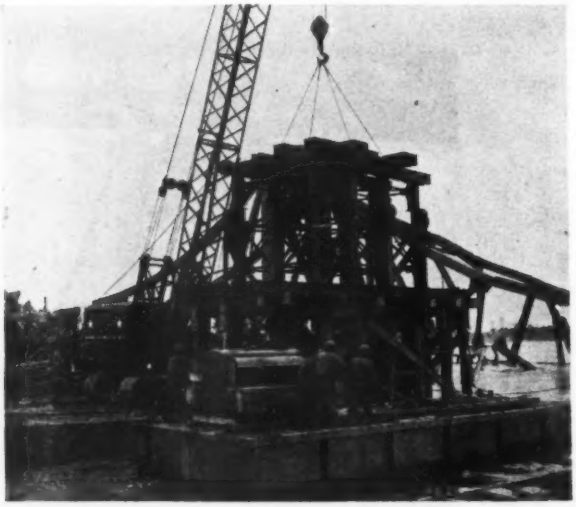
ing the movement of materials up from rear areas and in providing night and day switching service with six Diesel engines in the material-marshalling and bridge-construction area. The 707th Railway Grand Division and 720th Railway Operating Battalion were moved up and over the river to be ready to handle traffic the instant the bridge was open.

Maintenance of way men from the two operating battalions were utilized to rearrange and rehabilitate the yard facilities at Buderich and Wesel. At Buderich, where four yard tracks were available, the junction of two double-track main lines was rearranged to give eight tracks. At Wesel, originally a 14-track yard, the existing connection required a back-in movement to the yards for eastbound trains. A new connection, transforming the layout to a typical railroad wye, was provided to permit trains to head directly into the yards. Also, a straight track connection was provided across the yard lead to the main line to Munster to handle through traffic, and portions of the connecting tracks previously installed by the Germans were straightened.

## The Bridge

The bridge constructed at Wesel is a semi-permanent structure of 23 spans. The piers consist of timber piling at the base, which supports a special prefabricated steel pier structure utilized by the United States Army. The timber piles, driven to a penetration of 30 ft., were placed in groups of 21 or 24 for each pier. The superstructure consists of meter-beams, which are rolled steel I-beams one meter in depth, developed by the Germans and rolled for them by a plant at Luxembourg. On short spans two meter-beams were used under each rail, and on the long spans three such beams were placed under each rail, giving a total of 94 meter-beams. Including those used on the bridge structure over the adjacent canal, a total of 126 meter-beams was utilized on the project.

The length of the bridge is 1,752 ft., of which 1,074 ft. are over water, 452 ft. form the west approach and 226 ft. the east approach. The total weight of the bridge is 2,140 tons. From mean water level it is 36.67 ft. to the top of rail, 32.37 ft. to the bottoms of the meter-beams, 18.29 ft. to the tops of the prefabricated piers, and 16.29 ft. to the pile cut-off level. Scouring protection was provided for the piers.



Left—A Pier Under Construction. Below—General View of the Construction Area on the West Bank

## Quantities

All equipment and materials was moved to the site by rail or trucks. Approximately 5,000 cu. yd. of fill were required for the approach on the west side and about 700 cu. yd. for that on the east side where part of the old highway embankment was used. The timber piles used, of which 622 were required, were cut and assembled at points in France, Belgium and Germany. The prefabricated steel trestling was assembled in the yards at Geldern while the piling was being driven. The meter-beams, weighing from seven to nine tons, were moved in by rail from three points west of the Rhine. The track on the bridge was built with 75-lb. rail.

Approximately 2,400 men were involved in assembling and constructing the bridge. Five barges, constructed of Navy lighterage pontoons, were used to support skid-rig steam-driven pile drivers shipped from the United States. Five similar barges were used as general work barges, and three others carried cranes and derricks. A total of 780 of the Navy lighterage pontoons, each weighing 24 tons, were used. The pontoons were assembled in rear areas in strings of 12 each, were brought to a nearby point on trains, unloaded with a heavy-duty crane and skidded with a bulldozer to the site. At that point, four strings of pontoons were assembled side by side to form a pile-driver barge. Five strings of 12 pontoons were jointed to form each of the three crane barges, one equipped with a 25-ton stiff-leg derrick, and two with a heavy-duty crane each. In addition to the general work barges formed from the pontoons, ten small work barges equipped with air compressors and stiff-leg derricks or hoists were utilized.

In driving the piling, all five pile drivers were used continuously. The barges were shuttled into position by six Navy-type NTL medium tugs. In addition, one small tug, six "ducks" and seven "sea-mules" were used during the construction. All of this equipment originated in the United States and was shipped to the job. The only piece of equipment used which was found nearby was a catamaran barge. The "ducks" were used to pull piling off the stock piles and through the water to the pile drivers, for general contact and message work, and for the handling of personnel.

### Current a Hindrance

The depth of the river channel at the bridge site is 30 ft., and, owing to the fact that the speed of the current is four to five miles per hour, the construction work was carried out under difficulties. On the other hand, it was facilitated by almost perfect weather during the first five days and no enemy interference at all during the entire period. Also, the Engineers, in conjunction with the advance of the Ninth Army, rehabilitated the railroad line from Munchen-Gladbach to Krefeld to Wesel, and had almost unrestricted use of the railroad for hauling in material as desired.

At 11 p.m. on April 8 a test train, consisting of loaded cars pushed by a Diesel engine, was operated over the bridge, which was then declared open for traffic at 11:45 p.m. At 12:10 a.m. on April 9 the first train of rations moved across the Rhine.

Credit for the swift engineering and construction of the bridge structure goes to the men and officers of the 1056th Engineer Group under the command of Colonel James B. Cress of Palo Alto, Cal., former regional director of the Railroad Retirement Board for the San Francisco region.

What Was Left of the Yard at Wesel

Showing Damage to One of the Approaches to the Old Railroad Bridge

### Personnel

Plans for the bridge structure were approved by Colonel William T. Elmes, assistant general manager of the Engineering Section, Second Military Railway Service, who also specified the yard and line changes required. Operation over the bridge is controlled by Colonel George J. Mulick, assistant general manager, Transportation Section, Second Military Railway Service, under General Clarence L. Burpee, general manager of the Second Military Railway Service. Second Military Railway Service is part of the railroad organization coming under the jurisdiction of General Carl R. Gray, Jr., director general of the Military Railways on the Continent.

---

CROSSTIES WANTED—In an effort to overcome the present shortage of crossties the Association of American Railroads is publishing an advertisement in a large number of farm journals, pointing out that farmers can help by producing even a few ties from their wood lots. The advertisement states that the railroads will need 50,000,000 crossties this year. It says that there is no single source sufficiently large to meet the demand, but that if every farmer will cut and sell some of his timber the aggregate effect will be exceedingly helpful.

# Southern Pacific With Drainage

**Nearly all slides can be attributed in some degree to the presence of water, either on or beneath the surface. On the Southern Pacific, which has many miles of lines in mountainous country, drainage tunnels for intercepting and disposing of troublesome water have been used for more than 30 years as a means of controlling unstable hillsides. Such tunnels, ranging in length from 50 ft. to 1,200 ft., have now been installed at approximately 83 different locations. A tunnel now under construction will be approximately 2,000 ft. long when completed**

WITH a large proportion of the mileage of the Southern Pacific (Pacific Lines) traversing mountainous country, one of the foremost problems that is constantly before the engineering and maintenance departments of this road is the control of unstable hillsides to prevent slides from encroaching on, or otherwise doing damage to, the railroad's tracks. Out of its many years of experience with this problem, the company has developed a mode of procedure that calls for the use of every conceivable method of control in combinations best adapted to the varying conditions encountered at different locations.

Outstanding among the measures that have proved especially effective are drainage tunnels for intercepting and disposing of sub-surface flows around sliding areas. First used more than 30 years ago, the drainage tunnel has been employed on an increasing scale, until today there are approximately 83 locations on this road where such tunnels, ranging from 50 ft. to 1,200 ft. in length, have been installed. As a result, the company has amassed a large fund of experience and knowledge concerning the construction of such tunnels, which it has put to practical use in bringing to a high state of perfection its application of this effective means of dealing with sub-surface water. The latest step in this direction, taken within the last year or so, has been the acquisition of modern mucking equipment for use in constructing drainage tunnels.

### Rugged Terrain Encountered

The Pacific Lines of the Southern Pacific comprise a system of lines serving the Pacific Coast area and extending from El Paso, Tex., to Portland, Ore. In traversing this region, especially northern California and Oregon, the railroad encounters a great deal of rugged, mountainous country. With the tracks in many places located on or skirting mountain slopes, sub-surface conditions are frequently conducive to unstable tendencies in the overburden, with the result that slides are more or less commonplace. Under such conditions it is a constant struggle to prevent the unstable areas from getting out of hand and causing damage to railroad property.

An example of the severity of the problem is afforded by conditions on the Northwestern Pacific, an affiliate of the Southern Pacific, which extends from San Rafael, Cal., a short distance above San Francisco, northward to Eureka, a distance of 267 miles. For almost its entire length this line follows the Coast Range. At the present time there are in the neighborhood of 100 different locations on this line where difficulty is being encountered because of slides or the threat of slides. On the Pacific Lines of the Southern Pacific, the greatest difficulty is encountered on the lines in Northern California and Oregon, this being indicated by the fact that, of the 83 locations where tunnels have been installed, 79 are situated in that territory.

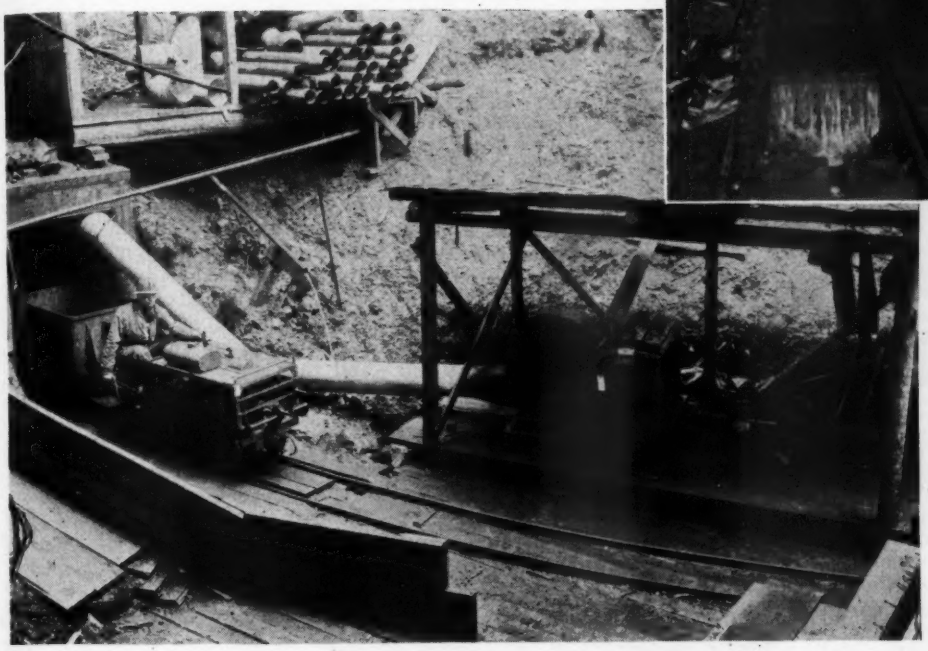
This Air-Driven Mucking Unit Was Obtained Some Time Ago Especially for Use in Drilling Drainage Tunnels

### Slides Act Differently

The experience of the Southern Pacific has been that slides assume a variety of different forms or patterns of movement. Some of them move slowly and more or less constantly, others move suddenly and with sufficient speed to justify the term "avalanche," while still others move only intermittently, with long intervals between movements. Some slides are accompanied by an upheaval of the material involved; others have a tendency to sink. Occasionally a slide occurs that seems to be dry. However, regardless of the manner of movement, the majority of slides can be attributed to the same fundamental cause, namely, the presence of excessive water either on or beneath the surface, or both.

Water causes some materials to break down or deteriorate in such a manner as to lose their cohesive strength. The presence of water also has the effect of increasing the weight of the material carrying it, thereby imposing an additional load

# Controls Slides Tunnels



Above — Interior View of a Tunnel Under Construction, Showing a Considerable Flow of Water Which Was Encountered 600 Ft. From the Portal. Left—This View of the Portal of a Drainage Tunnel Constructed Recently Shows the Special Motor Car That Is Used for Hauling Muck Cars. Note also the Gasoline-Engine Driven Blower Unit for Ventilating the Tunnel During the Construction Period

on the supporting agency. When water obtains access to inclined surfaces or planes between the same or different materials, it has a lubricating action that contributes to the instability of the overlying material. In addition, when water accumulates ahead, it may be forced into and through otherwise impermeable material, thereby enlarging the affected area and extending the plane of lubrication. It is thus apparent that water acts in different ways to create instability and that at any given location it may make itself known through any combination or all of the manifestations mentioned above.

### Control Measures

On the Southern Pacific it has been learned that, to be effective, slide-control efforts must contemplate (1) the interception of the surface and sub-surface water before it reaches the slide area, (2) measures to prevent surface water from percolating into the unstable area, and (3) the dewatering of the sliding mass. Obviously, it is not always necessary to carry out all of these steps at every location, but combinations of two or more of them are frequently required. On the Southern Pacific it is recognized that each slide is a problem in itself, requiring that the adopted and tested methods of stabilization be applied in accordance with the particular conditions.

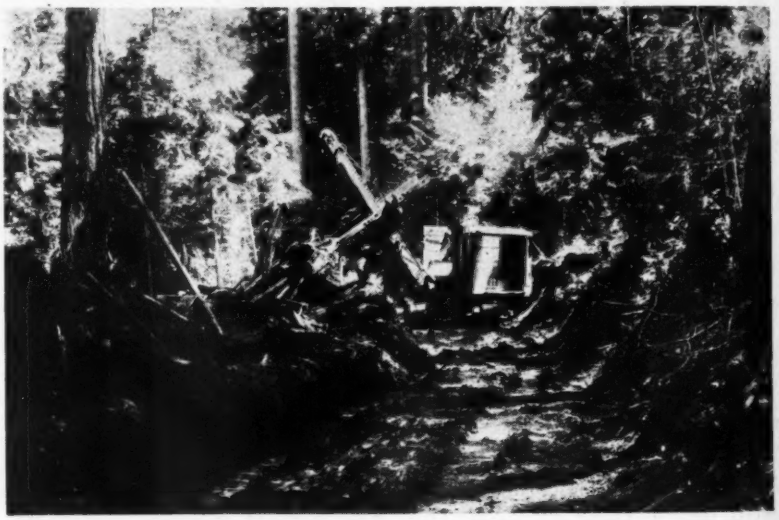
It will be noted that the carrying out of the three steps mentioned previously requires both surface and sub-surface drainage in the vicinity of the unstable area. In surface drainage the Southern Pacific makes use of various methods, either singly or in combination with each other, depending on the requirements of the particular location. These include, of course, the extensive use of open drainage ditches either alone or in combination with timber flumes or metal pipes to permit the runoff to be carried away without scour or erosion. Formerly it was the practice to construct surface drainage ditches by hand, but this work is now done largely with crawler bulldozers, which have also been found useful for terracing and smoothing sliding areas to obtain rapid runoff. Other methods employed to facilitate surface drainage include the filling of cracks in the surface of the slide by cultivation, the destruction of vegetation and the oiling of the surface.

### Always Helpful

It sometimes happens that adequate drainage of the surface is all that is necessary to stabilize a slide; in any event it is always helpful, even though sub-surface drainage may be necessary to effect a complete cure. However, thorough surface drainage is often difficult, especially at locations where movement has occurred in such a manner as to cause the surface of the ground to become uneven and to develop cracks. Such surfaces tend to hold rainfall and to direct it to the surface, or surfaces, of movement. Even at locations where adequate surface drainage can be accomplished, it often happens

that the difficulty is due to a combination of both surface and sub-surface water, and in such instances it is necessary to take measures for disposing of the water from both sources.

Where sub-surface drainage is required, the desired results can frequently be obtained by constructing interceptor sub-drains of corrugated metal or tile pipe laid in trenches backfilled with crushed stone. The drainage of the slide material itself is sometimes accomplished by means of corrugated pipe placed in holes drilled by a hydrauger. If it appears that a sufficient degree of stabilization cannot be achieved by these more common forms of sub-drainage, consideration is then given to the use of drainage tunnels as a means of obtaining the desired results.



**Left — Showing Part of a Pipe Line That Was Constructed to Carry Troublesome Water Away From a Slide. Below — Constructing a Drainage Ditch to Divert Surface Water from a Slide**

## Drainage Tunnels

The practice on the Southern Pacific is to provide drainage tunnels sufficiently large in cross section to allow space for carrying on the drilling and mucking work, and to provide them with timber linings of adequate construction to withstand any loads that may be imposed on them under the varying conditions encountered. Specifically, the company's present standard plan for such linings provides for a rectangular section having a clear width between the supporting members of 3 ft. 8 in. and a clear height of 5 ft. 6 in. or 5 ft. 8 in. However, these dimensions have recently been increased somewhat on certain projects to allow sufficient space for the operation of mechanical mucking equipment.

To provide for differences in the character of the material encountered when building drainage tunnels, the company has two standard plans for linings which differ only to the extent that one is of heavier construction than the other. In this latter plan the supporting sets, spaced 4 ft. apart, are constructed of 8-in. by 8-in. timbers, and consist of two side posts, a cap at the top and a sill at the bottom. A 3-in. by 8-in. transverse spreader is placed under the cap and another one of similar size on top of the sill. Longitudinal struts of 3-in. by 8-in. material are placed between adjacent sets, one at each corner. The side walls are lined with 3-in. lagging spaced in accordance with the needs of the particular material encountered. In the other plan, the principal members are somewhat smaller. In both designs timber spiling is used for lining the roof. A 2-in. by 12-in. plank laid on the bottom spreaders serves as a walkway for workmen. Finally, there is a narrow-gage track consisting of light-weight rails spiked to the sills.

Since the purpose of the tunnels is to intercept and carry away sub-surface water, means must be provided for handling such water, and this is done by means of a ditch in the tunnel floor, which is 9 in. deep, 12 in. wide at the bottom, and has 1-to-1 side slopes. Ordinarily the ditch is not paved, but if the tunnel is located in material that erodes or weathers easily, the ditch may be lined with concrete.

## Permanent Structures

Generally, drainage tunnels constructed in Oregon are lined with Port Orford cedar, while redwood is used in tunnels built in California, these woods being employed not only because they are available in contiguous territories, but also because they have good lasting qualities. The majority of the tunnels are considered to be permanent structures and hence they are maintained and repaired from year to year as necessary to keep them in adequate condition. In fact, some of the tunnels have been in existence 30 years or more and are still being maintained. However, it is occasionally the practice, when the lining of a tunnel has reached the end of its service life, to install a pipe in it to carry the flow, and then to backfill the space between the pipe and the tunnel walls, although this is not done unless the road is convinced that the tunnel has served its purpose. It is never the practice, for instance, to backfill tunnels at the more important slides, for it is reasoned that there is always the possibility that conditions may change at such locations to such an extent as to require that the tunnel system be expanded. For example, the runoff produced by unusually heavy snows may result in one or more new slides at a particular location, and the presence of an existing tunnel system may be an important factor in helping to cope with the new situation.

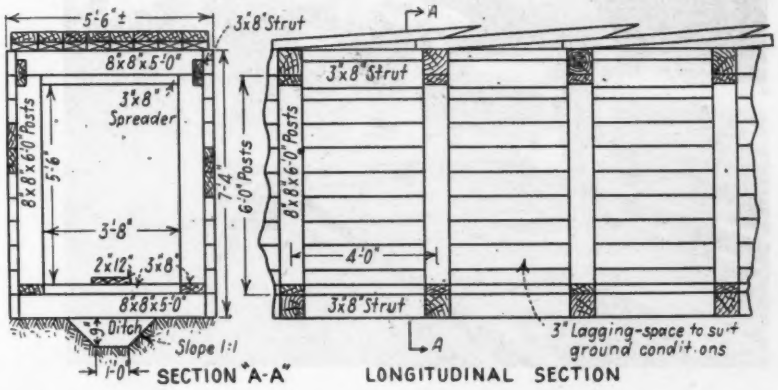
In its tunneling operations, which are carried out by company forces, the road uses the latest and most up-to-date methods and equipment. Pneumatic spades and drills are employed extensively, and drilling and shooting are resorted to, if necessary. Muck is generally hauled in cars with a capacity of 16 to 18 cu. ft. Formerly the loaded cars were pushed by hand or were pulled by a cable winding on the drum of an air hoist, but more recently the company has been using a small locomotive consisting of a specially-constructed gasoline-engine-driven motor car for drawing the muck cars.

For many years it was the practice to load the muck cars by hand, but the company has now acquired an Eimco Model 12 pneumatically-operated mucking machine which is being used with considerable success. While the tunnels are under construction they are ventilated by means of a gasoline-engine-driven fan, located outside the portal, from which a pipe line is carried through the tunnel to the working face. Aside from this pipe line each tunnel under construction also contains a power line for lighting purposes, a line for furnishing compressed air for the operation of pneumatic equipment, and a water line for use in case of fire.

### Survey Is First Step

As the first step when control measures are contemplated at a given location, a topographical survey is made of the slide and the surrounding area. In this work, a traverse is run with instruments, after which elevations for drawing contours are established, using a clinometer, a slope chain and a timber cruiser's compass if the area is wooded, and stadia methods if it is relatively free of obstructions. This survey is made for the purpose of showing the relative locations and elevations of any surface features that may have a bearing on the occurrence of the slide, such as water courses, springs, swampy or depressed areas and cracks in the surface of the earth. An important thing to look for in this connection is surface depressions at elevations above the slide, where the accumulation of water, with the resulting hydraulic pressure, might be a contributing factor in causing the slide.

Concurrently with the topographical survey, an exploration of the subsurface is undertaken, the purpose of which is to determine the nature and depth of any water-bearing formations present in the slide area, including the direction of flow, and the character of the sub-surface in general. This is done both by drilling and by means of dug shafts, the latter being considered an especially accurate method of making such explorations. In the drilling work a number of different tools are used, including power augers, core drills, churn drills and well drills. In some cases a test hole may be started in the form of a shaft and continued by drilling.




**Showing Details of the Heavier of the Two Designs for Lining Drainage Tunnels**

### Details of Shafts

The shafts are 3 ft. 6 in. by 4 ft. in section, and as the digging progresses the walls are shored with 3-in. timbers with interlocking joints at the corners. Where necessary because of the nature of the surrounding material, the shoring is reinforced by 4-in. by 4-in. posts at the corners and lateral struts of the same size. Hand-operated windlasses or air hoists are used for raising excavated material to the surface. The location of the test shafts are carefully chosen to permit them, if possible, to be incorporated in the alinement of the drainage tunnel or tunnels in order that any water flowing into them can escape into the tunnel. This is especially important when the shafts are dug in swampy or depressed areas, in which event, with the tunnel as an outlet, they serve as a means of draining such areas. When water collects in the shafts during construction, it is removed by various methods, including pumping, siphoning or the boring of horizontal holes.

It is considered important wherever possible to maintain the test shafts and drill holes in an open condition in order that the inflow of water and the direction and extent of its movement can be observed. It is hardly necessary to mention that a careful and accurate log is kept of the discoveries at each test shaft or drill hole. It frequently happens that, as the exploratory work progresses, the findings at certain holes or shafts will suggest further investigations at other points.

As a means of determining the direction of flow of sub-surface water, the road has used Flourescein dye with successful results. The presence of this substance in water can be detected visually in concentrations of as little as one part in 10,000,000. The direction of flow of sub-surface water is determined with the dye by inserting it in certain test holes and then checking to see if it appears in the water at other holes, springs or streams in the vicinity. The presence of the dye in small concentrations is determined by placing a sample of water in a long test tube and then looking longitudinally into the tube to obtain depth. When dissolved in water, the dye, as seen by reflected light, produces a brilliant green color.

When the investigation at a particular location has been completed, the company is in a position to arrive at definite conclusions regarding the source of the water causing the difficulty and the measures best calculated to overcome it. If it is decided that a drainage tunnel is the solution, the data obtained during the sub-surface investigations are used as a basis for plotting its alinement and profile, providing for any branches or drifts that may be necessary to tap or intercept the various flows of water causing the trouble.

Important factors in helping to tap water-bearing formations at different levels are drilled holes or dug shafts, known as upraises, that are projected upward from the tunnel roof, these being provided at varying intervals, sometimes with drilled holes and dug shafts alternating, depending on the conditions encountered. Occasionally, it is possible to project the tunnel in relatively dry ground under a stratum of impervious material through which up-

*(Continued on page 584)*

The Maintenance Practices Employed at Most Terminals Are the Same as Those Used Out on the Line

**This is a final report on this subject by the Committee on Economics of Railway Labor of the American Railway Engineering Association.* The material presented in the report was obtained from the maintenance officers of a selected group of railroads maintaining extensive terminal facilities, and, geographically, covers roads in all parts of the United States and Canada. Essentially, the report is divided into three parts (1) organization, (2) methods, and (3) equipment**

# Terminal Maintenance—

# Organization, Methods and Equipment

IN GENERAL, each railroad endeavors to carry into its terminals the same organization for maintenance as that prevailing outside the terminals. In fact, on some railroads, the terminal facilities are so extensive that an entire divisional organization is set up to handle the various classes of maintenance work.

Track facilities are under the supervision of a roadmaster or supervisor of track, with one or more assistants, depending upon the extent of the work. Under the roadmaster's supervision, the section foremen and gangs are assigned to specific territories, with definite headquarters, in the same manner as outside of terminals. However, due to the variety of their work, terminal gangs are generally larger than the road section gangs and, to provide flexibility in them, many roads have one or more assistant foremen in each gang, depending upon the size of the gang and the frequency with which it must be split up to do several different jobs.

Except on one road, each foreman is assigned a specific headquarters and territory, as this has been found to be the most practical and economical from the standpoint of their work. One terminal company reports that it is employing a floating-type section gang for all track work, except that on main lines, explaining that this arrangement is best at the present time because of the manpower shortage and the frequent necessity of using larger gangs at various locations—these larger gangs being made up of several small section gangs.

*Prepared by a subcommitte, of which F. J. Bishop, engineer maintenance of way, Toledo Terminal Railroad, Toledo, Ohio, was chairman.

### Extra Gangs

Practically all of the railroads reporting indicate the extensive use of extra gangs. These gangs, consisting of about 20 men, are used to handle all of the larger jobs, such as rail laying, ballasting, heavy tie renewals and yard surfacing. On some terminals, extra gangs, consisting of men or women, both white and colored, are also used for cleaning yards, cleaning cars and other work of this character. One railroad has used extra gangs, consisting of 75 men, economically during the summer months. This road also reports the use, during similar periods, of a specialized gang of 10 men for the maintenance of crossings. Likewise, a specialized gang of 10 men is used by this road for the maintenance of its drainage facilities.

Bridge and building work is usually carried out under the supervision of a master carpenter with one or more assistants. In some cases, several types of gangs come under the master carpenter's supervision, these including carpenter gangs for bridge and building repairs, paint gangs, and water service and plumbing gangs. In some instances these gangs have specific headquarters, while in others they are shifted from one point in the terminal to another, depending upon the nature and extent of the work. Some large engine terminals and passenger terminals require several types of bridge and building gangs on duty daily to maintain the facilities properly.

Practically all terminal railroads make effective and economical use of welding crews for building up frogs, switch points, crossings and rail ends, and for any type of emergency welding and cutting work. These gangs usually include from two to four men.

Practically all the roads reporting state that they do not use special methods in the maintenance of their terminals—that their practices are the same as those employed out on the

road. However, owing to the heavy concentration of facilities in a relatively small area, many of the roads stressed the need for flexibility in their terminal organizations and methods to permit them to cope with the large number and variety of emergency jobs encountered.

Most terminal running tracks are occupied by trains a large part of the time. Therefore, an attempt to lay rail or to make heavy tie renewals, or to install ballast and surface track under traffic, is decidedly expensive. A high degree of co-operation with other departments, and particularly the transportation department, is most essential for economy in terminal maintenance, and likewise to avoid traffic interruptions and delays. Several railroads actually utilize the services of a trainmaster to handle traffic properly around sections of track taken out of service because of heavy repairs. Some roads report that, even with such co-operation, certain tracks can not be taken out of service for repair, and that where such is the case it is difficult to justify the use of certain types of mechanical tools.

One railroad reports that excellent results accrue from periodic inspections of its terminal facilities by the maintenance officers in charge, accompanied by representatives of the operating, mechanical and safety departments. This practice, it points out, leads to better co-operation and to a better understanding of the problems of the maintenance officers by the other departments.

### Highway Trucks

Several railroads stress the need for competent mobile supervision of their terminal gangs. Maintenance men at terminals may be employed on several different jobs in locations that are miles apart, and the supervisory staff should be provided with automobiles in order that these gangs can be contacted frequently.

All roads reporting use the same labor-saving equipment within their terminals as they use outside. In fact, many roads report that they are able to justify the use of some labor-saving tools at terminals, which normally can not be justified on a road section.

The reports from the various railroads indicate strongly the value of trucks for transporting men and materials from headquarters to the points at which work is to be done, the size and type of truck depending upon the character of the work for which it is used. Light panel trucks are used by small carpenter gangs for making emergency repairs, as well as by water service gangs, plumbing gangs and electrical maintenance gangs,—many of these trucks being equipped with small tools and a supply of the materials required.

**Trucks Are Widely Used at Terminals for the Transportation of Men and Materials**

Larger trucks are used by bridge and building gangs engaged in heavy repairs, some of these trucks being equipped with hand-operated derricks to permit the handling of heavy materials. Power-operated dump trucks are also used extensively for removing dirt and other materials in connection with various types of cranes and other excavating equipment. Trucks are used extensively by welding forces engaged in the repair of frogs and switches, and have shown definite economies according to practically all terminals reporting.

Trucks, in general, save considerable time in the transporting of both men and materials. One railroad estimates that as much as 40 per cent of the time of its bridge and building gangs, in getting to and from work, was lost because of an attempt to use on-track equipment.

### Other Equipment

Another very useful unit of equipment reported by several railroads is the light rail-mounted crane. This small gasoline-driven, self-propelled crane is able to perform many terminal jobs that would otherwise have to be done by hand. Other roads report the use of off-track tractor cranes and of locomotive cranes as showing economies in terminal maintenance.

Several railroads have directed particular attention to the use of small chemical weed-killing units, towed by motor cars. Other roads employ weed burners, handled in the same manner, which are being used during the winter for melting snow. In this latter application they have shown marked economies on yard leads and at interlocking plants and car retarders.

Many of the terminal railroads reporting have established shops for carpenter, machine and pipe work, and for tin smithing and electrical repairs. These shops are equipped with the necessary machine tools to handle light repairs to machinery and equipment and to construct special items required in the maintenance of large terminals. Carpenter shops have proved particularly economical at many terminals.

**Carpenter Shops Have Proved Highly Economical at Many Terminals**

One railroad, with considerable dock facilities to maintain, has found economical use for small work boats. These are equipped with mast and boom, and with a compressor of sufficient capacity to supply a variety of air tools, and also to power the neces-

sary hoisting equipment for the handling of heavy timbers.

Some railroads have found mechanical devices economical for cleaning sewer and water lines. Other railroads make use of the air provided at pneumatic interlocking plants, in train yards and near shops, for the operation of pneumatic tools.

Two of the roads report that they have found it difficult to justify the purchase of specialized tools for many operations, especially tools designed to do only one type of work, because such tools cannot be kept busy for a sufficient length of time during the year. These roads report that those tools that can be used for several different types of work, such as small, portable, off-track compressors, are very economical—these compressors, to the extent of their capacity, being used to operate all types of pneumatic tools. One railroad reports using a special tool consisting of a saw, a pump and a drill, all in one unit.

Practically all railroads reporting stress the need, now and in the future, of eliminating expensive work-train service through the use of off-track maintenance equipment and the automotive transportation of men, tools and materials.

Accompanying this report is a list of the tools and equipment usually provided maintenance gangs at terminals, as reported by the various roads.

**Tools and Equipment for Terminal Maintenance Gangs**

*Track Department*

- Air compressors
- Augers—pneumatic and mechanical
- Bolt tighteners—pneumatic and mechanical
- Bulldozers
- Concrete and pavement breakers
- Cranes—light rail, locomotive, crawler and truck-mounted
- Derrick push cars
- Discers
- Grinders—pneumatic, gas and electric
- Jacks—power
- Loaders—head-end
- Motor cars and trailers—heavy and light
- Mowers
- Rail expanders
- Snow brooms—mechanical
- Snow loaders
- Snow melting equipment—weed burners, switch heaters and oil burning torches
- Track lubricators
- Tractors
- Trucks
- Weed killing equipment—chemical and burners
- Welding and cutting equipment—electric and gas

*Bridge and Building Department*

- Air compressors
- Augers—pneumatic and electric
- Cleaning devices for sewer and water line
- Concrete busters
- Cranes—truck-mounted
- Derrick push car
- Hammers—air and electric
- Hoists—pneumatic and mechanical
- Jacks—hand-operated and power
- Mortisers—power
- Pile drivers
- Power plants—electric
- Pumping equipment
- Saws—mechanical for heavy timber
- Saws—pneumatic and electric
- Spray painting and oiling equipment
- Trucks
- Welding units—gas and electric

## Southern Pacific Drainage Tunnels

*(Continued from page 581)*

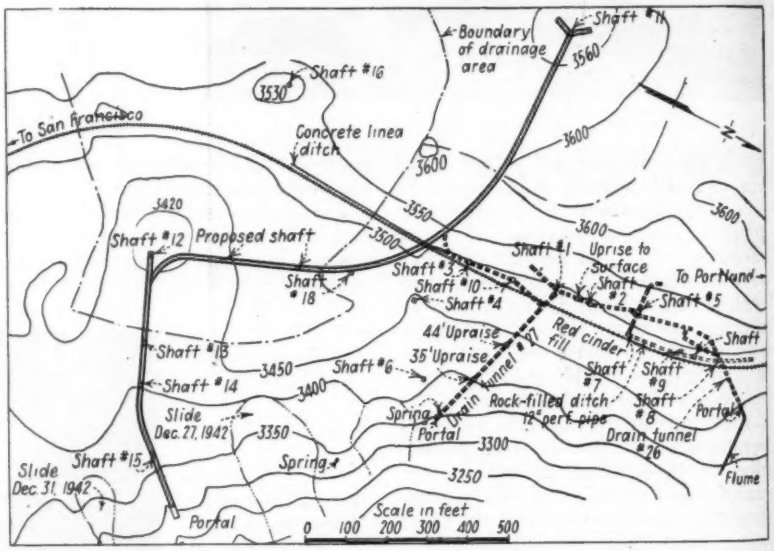
raises can be dug to tap water flows in overlying strata. If at all possible, the tunnel is laid out with an alinement and grades that will permit the use of the regular mining equipment in drilling it.

### Methods Illustrated

An example of a situation in which a tunnel was chosen as the method to be employed in dealing with a serious slide is illustrated on the accompanying drawing. The location shown is on the Cascade line of the Southern Pacific in Oregon. At this location a slide, shown by a dashed line near the lower left-hand part of the map, occurred on December 27, 1942, and caused considerable damage to company property. (The track affected by this slide is not shown on the drawing. The track extending across the middle portion of the map is another section of the same line.)

The tunnel that was projected to cope with this slide is shown by a double solid line. It will be noted that the tunnel portal is located somewhat to one side of the slide area, and that from this point the tunnel extends uphill to tap a depressed area above the slide. From this point it swings around behind the slide and then uphill again to tap another depressed area at a considerably higher elevation. Note also that a number of the test shafts dug during the survey have been incorporated in the alinement of the tunnel and that several additional shafts are proposed.

This map also shows two existing tunnels, indicated by dashed lines and designated as drain Tunnels 26 and 27, which were constructed earlier to cope with slides affecting the track shown. These tunnels, it will be noted, terminate in a veritable network of drifts or branches. Apparently they are inter-connecting, with a connection also contemplated between Tunnel 27 and the proposed tunnel. Drainage facilities other than tunnels shown on the map include a concrete-lined ditch and a rock-filled ditch carrying a 12-in. perforated pipe, both discharging into the tunnels, and a flume for carrying the flow from Tunnel 26.




**Contour Map of a Slide Area, Showing the Location of a Drainage Tunnel (Double Solid Line) That Has Been Projected to Cure the Slides Indicated in Lower Left Hand Portion of Map. The Track Affected by These Slides Is Not Shown. Dashed Lines Indicate Existing Tunnels**

All slide-control work on the Southern Pacific is under the general direction of E. E. Mayo, chief engineer, C. J. Astrue, assistant chief engineer, and F. L. Guy, engineer maintenance of way and structures, and under the direct supervision of F. H. Monroe, engineer of drainage.

# New Tools for Rail Laying

# Promote Better, Faster Work

By E. L. BANION
General Track Foreman
Atchison, Topeka & Santa Fe
Topeka, Kan.*

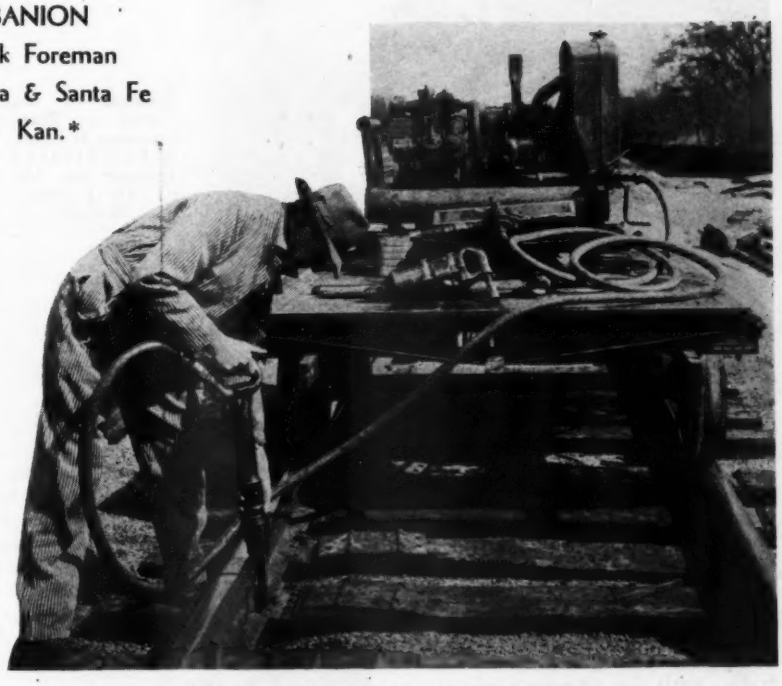
ALTHOUGH the average rail-laying gang of today is already highly mechanized, continual progress is being made in providing such gangs with new and different machines and devices to enable them to do their work faster, better and more economically. Not only has much progress been made in improving and perfecting the more common types of machines used in laying rail, but many new ones have been added to the list of equipment used for this purpose.

The more common types of machines now used by large rail-laying gangs include power track wrenches, cranes and rail layers, power adzers, spike drivers, power bit grinders, track drills, creosote applicators, etc. Additional machines for rail-laying operations, either already in use or under consideration for the future, include power gagers, portable rail saws, cribbers, tie plate liners, improved skeletonizing devices, and various pneumatic tools, such as chisels, impact wrenches and wood boring machines.

### Removing "Frozen" Nuts

For operating the various pneumatic tools mentioned a four-tool air-compressor, mounted on a standard push car, may be used, the push car being moved along by one man. Among the tools carried on the push car is a "long-stroke" rivet buster with a chisel point, which is used to split the nuts on "frozen" bolts, thereby speeding up the work of removing nuts that cannot be turned by the power wrench.

*Since this article was written Mr. Banion has been promoted to assistant division superintendent at Needles, Cal.



Splitting a "Frozen" Nut with a Rivet Buster

Another air tool carried on the push car is an impact wrench which, among other applications, is used to remove the lag screws holding down the planks at road and street crossings. When hand-wrenching methods are used for this work it is a common source of delay to the rail gang, for the removal of long lag screws by hand is a slow task. When an impact wrench is used for this work it is done in only a fraction of the time that would otherwise be required, and the rail-laying operations are not delayed.

**That the mechanization of rail-laying gangs is a continuing procedure is shown by this article in which Mr. Banion describes how the more common types of machines used by such gangs are being augmented by additional tools and devices. Some of these additions consist of machines that are already on the market, such as various types of air tools, but others have been developed to meet specific needs.**

Air tools are not only useful when removing wood planks at grade crossings but in replacing them as well. Using hand tools, the drilling of lag screw holes, the countersinking for the screw heads and the application of the lag screws themselves are tedious operations at best. With the power tools now available this work can be performed with minimum effort and at a considerable saving in cost.

### Speeding Switch Work

Another type of work for which the air tools have proved highly useful is in connection with rail-laying operations through switches. For instance, a wood-boring machine carried on the push car with the compressor is being found particularly useful for drilling lag screw holes for brace plates at switches, and, in addition, is being employed for boring holes in crossing planks. Using the wood borer, the impact wrench and a power track

drill, the time required to complete the renewal of a switch has been reduced approximately 50 per cent.

So far, this discussion has dealt with existing tools that have been adapted to rail-laying work. In addition to these, there are a number of devices, now in use or contemplated, that are designed especially to perform specific tasks. One of these is a tie-plate liner.

Removal of Lag Screws at Plank Crossings Is Greatly Facilitated Through the Use of an Impact Wrench

To secure the proper gage when laying rail, it is agreed that the rail must be set in the position that it will occupy when properly seated under traffic, with the shoulders of all tie plates out from under the rail. This condition must be satisfied before any gage-spiking is done if the gage is to remain as it was when the rail was first spiked.

### Tie-Plate Liner

To insure that the new rail, when first placed, will be set within the shoulders on the tie plates, a device was developed to permit lining the tie plates to their proper position before the rail is placed. Essentially this device consists of a light frame of steel tubing and angles, which has rollers on one side and a length of 1-in. angle on the other that, resting on the ties in much the same manner as a sled runner, serves as a guide or stop for lining the tie plates. As the device is moved along the track by one man, another, using a deformed scuffle hoe, pushes the tie plates against the 1-in. angle, thereby placing them in the proper position to receive the rail.

The gaging of the track is another task that is being performed with the aid of special equipment. Where power gaging is not used, a tool to move the rail into position for gage spiking will do much to eliminate the practice of striking the web of the rail with a spike maul in connection with the gaging work, and is much faster than the bar ordinarily used.

To date the application of power methods to the driving of tie plugs to insure that they will be fully driven has not been given much thought, but it is felt that improvements in present practices are necessary to insure more satisfactory workmanship.

Some of the devices that are used in rail-laying work may appear to be of small consequence, but it should be remembered that the direct saving does not always constitute a true picture of the over-all saving or other advantages obtained. For instance, the use of a templet to mark rails for drilling in the field, to insure that the bolt holes will be properly centered, does not appear, on the surface, to have important consequences. Its true value, however, comes into focus when it is realized that off-center drilling of bolt holes can result in costly rail failures.

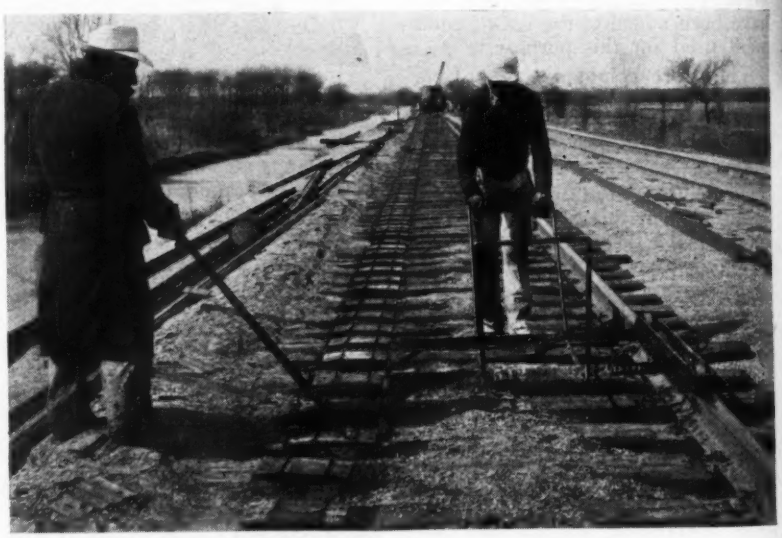
### Other Machines

Aside from the devices and machines discussed above there are still others to be considered, such as the power saw to cut rails. Such saws may not cut rails as fast as it is possible to break them with a sledge, chisel and leverage, but there is a factor of safety involved, because the field nicking and breaking of rails by some methods must be considered as causing the formation of checks in the rail that may lead to future failure. It is likely that the use of power saws for cutting rails to be used in main-line tracks will eventually become standard procedure.

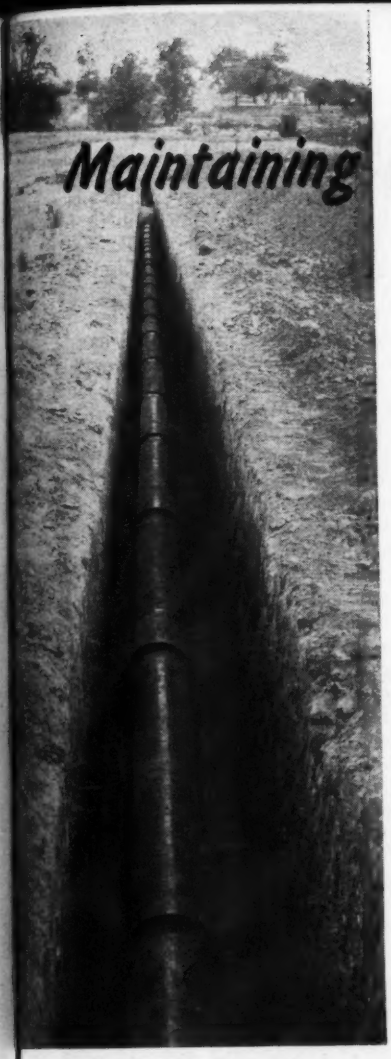
The practice of using a cutting torch for stripping old bolts is a debatable one. Not only does this practice involve the risk of damaging the rail and lock washers, but it also has the effect of destroying any salvage value that the bolts may have.

The increasing mechanization of rail-laying gangs has led to the practice, prompted by the desire to promote greater safety and efficiency, of furnishing various protective devices for use by certain of the men, including shin and foot guards for adzer operators and safety goggles for many of the workmen. Even such items as rubber boots and rubberized gloves for men handling creosote, and

*(Continued on page 591)*



Lining Tie Plates with a Device Specially Developed for this Purpose



A Cast Iron Pipe Line With Bell and Spigot Joints

# Maintaining Water Service Facilities—

# PIPE LINES

## Part I

By C. R. KNOWLES
Superintendent Water Service (Retired)
Illinois Central, Chicago

No. 12 of a Series

**This is the first part of a two-part installment dealing with the maintenance of various types of pipe lines employed in railway water service. In it the author discusses the classes of pipe in common use, the detection of leaks, the making and repair of various types of joints, and the causes of water hammer. Part II will treat primarily with the cleaning of pipe lines and their protection against corrosion and freezing**

PIPE used in railway water service includes almost every kind made. Among those types in common use are cast iron, wrought iron, steel, asbestos-cement and wood pipe. Those in less general use include lead, copper, brass, concrete and plastic pipe. It is estimated that more than 30,000 miles of pipe of all kinds are used in the delivery of the 600 billion gallons of water used annually by the railroads of North America.

Approximately two-thirds of the pipe used is in underground service, and is largely of cast iron. Next in importance as to the amount in use is wrought iron and steel pipe, representing about 10,000 miles. These classes of pipe are employed largely for service above ground, for well casing, and for drop lines in wells, but are also used to some extent for underground service. Wood pipe is also used underground and was one of the first types of pipe to be employed in this service. Wood pipe has been supplanted largely by other kinds of pipe, but it is still used to some extent, principally in the western part of the country.

Asbestos-cement pipe is a comparatively recent development in this country, although it has been used in Europe for more than a quarter century. This class of pipe has been employed to a considerable extent in underground railway water service lines in recent years. The use of copper and brass pipe has been confined largely to plumbing installations, for oil feed lines and in special service. Lead pipe has also been used chiefly in plumbing and for the smaller service connections. Plastic pipe is still more or less in the experimental stage so far as railway water service is concerned.

The maintenance of pipe lines involves the detection of leaks, repairs, the prevention of corrosion, thawing those that become frozen, the prevention of waste and cleaning. As a rule, the maintenance of overhead pipe lines does not present the same problems as underground lines. Leaks and other defects in above-surface lines are readily apparent and, with few exceptions, are readily accessible for repairs. Pipe laid underground, on the other hand, presents an entirely different problem, as defects are rarely apparent until a failure occurs, and are sometimes difficult to locate and repair. Among the cause of leaks and other failures common to all pipe lines are: (1) poor joints and connections; (2) unequal settlement of pipe; (3) jars and shocks occasioned by vibration and water hammer; (4) expansion and contraction; (5) deterioration through corrosion, and (6) incrustation.

Cast iron pipe is used almost altogether for underground service and, in railway water service, exceeds in amount used all other kinds of pipe combined. This class of pipe has been used by the railways for more than 100 years, and there are records of existing installations that were made more than 90 years ago. The principal cause of leaks in cast iron pipe is failure of the joints. Practically all cast iron pipe in railway water service is laid with American Water Works Association standard bell and spigot joints, an excellent type of joint if well made. Many miles of bell and spigot joints have been in service for scores of years without giving trouble.

### Lead Joints

There are three reasons for the failure of bell and spigot joints: (1) a poorly made joint; (2) excessive vibration or movement of the pipe; and (3) water hammer. While these joints are simple in construction, they should be made only by an experienced water service repairman. The most common type of bell and spigot joint is made with poured lead, but the use of lead wool, cement, and

Copyright 1945, Simmons-Boardman Publishing Corporation.

patented sulphur compounds is being followed to a considerable extent.

Extreme care is necessary to make a good joint, especially in wet trenches. The joint should be kept as dry and clean as possible and, where lead or compounds are used, it should be made with one pouring. If there is any moisture in the joint, a little kerosene may be poured into it before pouring the lead. To prevent "blowing," kerosene or other oils should not be used with compounds. In extreme cold weather it is sometimes desirable to heat the joints of large pipe to avoid chilling the lead or compound before the joints are completely filled.

The correct yarning of bell and spigot joints is important regardless of whether lead, cement or joint compounds are used, as the yarn forms the compressible packing that insures tight joints. The yarn, jute or other substitute materials, should be driven into place with a yarning iron and hammer until thoroughly compacted, and a uniform face should be left as in packing a stuffing box. The joint should be filled with packing to within two inches of the face of the bell.

### The Water Service Series

**The 11 articles in this series, published previously, include the following:**

(1) Introduction (April, 1944)
(2) (3) (4) Sources of Supply (May, June & July, 1944)
(5) The Maintenance of Pumps — Reciprocating Pumps (Aug., 1944)
(6) The Maintenance of Pumps — Centrifugal Pumps (Sept., 1944)
(7) The Maintenance of Deep Well Pumps (Oct., 1944)
(8) Miscellaneous Pumps (Dec., 1944)
(9) (10) Power Units (Jan. & Feb., 1945)
(11) Power Transmissions and Controls for Pumps (April, 1945)

### Poured Joints

In making poured joints with either lead or compound, the first step after yarning is to close the joint with a runner made to hold the molten lead or compound in place until it has solidified. The runner, of rope, square flax packing or other suitable material, should be placed on the joint opening so that it fits closely against the face of the bell and the outside of the inserted pipe. Clay moistened to the consistency of putty should be used to form a pouring gate, and, if necessary, additional clay should be used to make a tight joint between the runner and the pipe. When lead is used, the pouring gate should be built up to at least two inches above the joint opening.

In some cases the joint is double caulked, first with a thin caulking tool and then with a tool that will just enter the joint space. This requires more work than if only one tool is used, but insures a good tight joint. Excessive caulking should be avoided as it may result in cracking the bell.

Lead joints should be well caulked, beginning at the bottom of the pipe and working up to the gate. Lead wool, which is ordinary lead in shredded form and furnished in the shape of loosely made rope, may be used instead of molten lead or compounds for making joint repairs in wet trenches or to submerged pipe lines. Leaking lead joints may often be made tight by simply recaulking the lead. Defective joints should be cut or burned out and the joint remade.

### Compound Joints

A number of substitutes for lead in bell and spigot joints have been developed. These are variously known by trade names and are mixtures of fine iron particles, sulphur, ground slag and other materials. They are furnished in both powdered and solid form. Service records indicate that these compounds have proved satisfactory for jointing purposes. Less heat is required for melting them and care must be used to avoid overheating them.

When employing joint compounds, it is important that the inside of the bell and the spigot end of the pipe be perfectly clean, and also that dry jute is used, as tarred or oily packing may cause the inside of the joint to become oily and result in a poor joint. The runner should be placed as with a lead joint, but the gate should be built up to 6 or 8 in. above the bell as the compound, being lighter than lead, requires a higher pouring head. Compounds do not require caulking and, where used, the joint is ready for use as soon as it has cooled. The joint may sweat or seep a little when water pressure is applied, but it will soon take up and become tight.

### Cement Joints

Cement is used extensively as a jointing material for gas mains and, to a lesser extent for water mains. The recommended practice in making a cement joint is that the joint first be packed with jute that has been dipped in a thin mixture of cement and water, which is driven into place with a yarning tool. The cement for the joint itself should be a mixture of three parts of neat cement and one part of water. This mixture should be kneaded thoroughly by hand, using rubber gloves to protect the hands. The consistency, when thoroughly mixed and kneaded, should be such that no moisture can be squeezed out of the mixture. The cement should then be rammed into place with a wooden or metal tool similar to a yarning tool, but with a wider and thicker face. The joint should then be finished with a fillet of cement at the face of the bell.

Only enough cement for a single joint should be mixed at a time, and it should not be allowed to stand more than three minutes before using. Upon completion, the joint should be protected from loss of moisture for 48 hr. or until it has hardened thoroughly. It should, of course, be prevented from freezing. Where the pipe is subject to recurrent vibration or disturbance, as, for example, where it is laid under or adjacent to tracks or in soft marshy ground, special bell and spigot repair clamps are available to prevent leakage and joint failure.

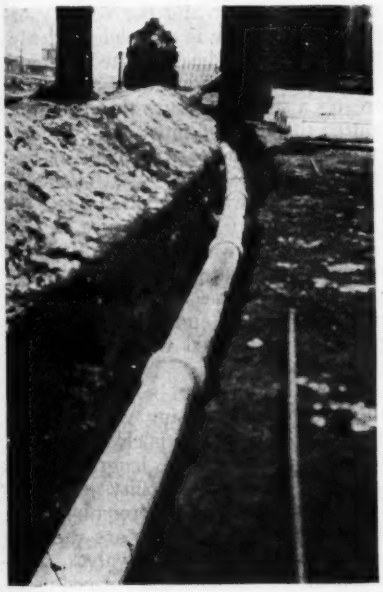
**Spiral-Welded Pipe With Welded Joints**

There are more than thirty different types of mechanical joints for cast iron pipe, some of which are well adapted to use where pipe is laid under unstable conditions as, for ex-

ample, under tracks, in soft ground and for submarine lines. Space limitations will not permit a discussion here of the maintenance of these various special types of joints; therefore, for details in this regard, the reader is referred to the manufacturers of these joints.

### Protection Against Damage

Laying pipe under or immediately adjacent to tracks should be avoided wherever possible, but where this cannot be done, every precaution should be taken to protect both the pipe and the track. The smaller size pipe lines present no particular problem under good soil conditions, provided they are laid to a depth of not less than 5 ft. below the ties. The pipe trench



should be as narrow as practicable to avoid disturbing the ground as much as possible. The earth should be tamped firmly under, around and over the pipe, and the pipe should be laid so that no joints come under the track. As an added precaution, leak prevention clamps should be applied to joints that are immediately adjacent to the track.

Larger pipe laid under tracks should be placed in carrier pipes or conduit capable of supporting the roadbed, track and traffic. The carrier pipe should be open at both ends, and should be well drained to prevent the accumulation of water, freezing and other possible damage to the pipe and the track. In some cases, supporting the track by cribbing over the pipe line, or the driving of protecting piles has proved satisfactory. Where the soil under the track is soft, as in fills or in swampy ground, pipes should be enclosed in carrier pipes or otherwise protected, regardless of their size. The protection of pipe lines laid under tracks necessarily represents some additional expense, but it will pay in the long run in less maintenance for both the tracks and the pipe lines.

Right — Making a Mechanical Joint in a Cast Iron Pipe Line. Left Below— An Asbestos - Cement Pipe Line

Underground mains are sometimes broken through settlement, shock or expansion and contraction. Where such breaks occur the water should be shut off on each side of the break and the pipe uncovered for the full length of the broken section. If the pipe is broken off square, or the fracture is short, it may be repaired readily by using a split-sleeve, or other quick-repair type coupling, of which there are several on the market, including the expansion type of bolted coupling provided with rubber gaskets.

### Split-Sleeve Coupling

The straight split-sleeve type of coupling, which is generally used only on cast iron pipe, is designed to be placed over the pipe and bolted in position, the open ends being leaded and caulked as in the case of an ordinary bell and spigot joint. Those types of quick-repair couplings employing rubber gaskets are self-sealing without the use of lead.

Another type of quick repair coupling is held in place by wedges or keys which are driven into place with a hammer, no wrenches or other tools being required. If the fracture is too long for a split-sleeve or other type of repair coupling, the damaged section of pipe should be cut out and a new one inserted. If pipe of the correct size is not available for this purpose, emergency repairs may be made by breaking out the broken portion of the pipe and placing a larger section of pipe over the broken ends and making a lead joint at each end as with a split sleeve. Repair clamps and couplings are well adapted to the repair of splits, cracks and holes in pipe lines and are available in a wide range of shapes and sizes.

The term wrought pipe is applied to all seamless, rolled and welded pipe, with, as a rule, little distinction being made between genuine wrought iron pipe and wrought steel pipe. There is a wide difference, however, in the physical characteristics of the two classes of pipe. Genuine wrought iron pipe is more resistant to corrosion than steel pipe; it will weld more readily without a flux. It has greater resistance to repeated stresses, which makes it desirable for use as drive pipe and rotary drill pipe in wells. It also threads and bends easier than steel pipe. Steel pipe, on the other hand, has a higher tensile strength than wrought iron pipe and its cost is less. Steel pipe is stocked by all water service material supply houses and is generally more readily available than wrought iron pipe, which at many points may be stocked only by the larger supply houses.

### Connections

Both flanged and threaded fittings and connections are used on wrought pipe, flanges being available for pipe as small as ⅛ in. Flanges are used because of their easier assembly and take-down for repairs. Most of the flanges used in railway water service are threaded to the pipe, although welded, cast and forged flanges are also used. In making up flange joints, the faces of the flanges should be smooth and clean, and the gaskets used should be of the correct size and thickness. Graphite and oil should be applied to the gaskets, which will permit easier removal if necessary. The faces of the flanges should be in perfect alinement, and the bolts should be tightened alternately on opposite sides and pulled up squarely and evenly. The threads of bolts and nuts

should be well lubricated with oil.

Good pipe threads prevent leaks and reduce maintenance. Poor threads invariably result in a weak, leaky joint. Pipe dies should be maintained in good condition and care should be exercised to cut clean straight threads. Occasionally the threaded end of a pipe will be damaged in handling. Usually this can be repaired by running a die over the threads to straighten them. If they are badly damaged they should be cut off and the pipe rethreaded.

Damaged threads in valves and fittings can usually be repaired by running a tap into the threads. The threads on old pipe or fittings should always be cleaned and oiled before using. Good threaded joints require a metal to metal contact, and if the threads are in good shape no excessive pressure is required in pulling up the joint. A lubricant of some kind should be used to reduce the friction, but "pipe dope" should not be relied upon to compensate for poor workmanship.

The use of suitable wrenches is essential to good pipe work. A wrench that is too small makes it hard to pull up a joint, but there is greater danger of damage in using one that is too large. When working on galvanized pipe, pipe wrenches should be used carefully to avoid damaging the coating. When handling plated or polished piping, strap wrenches should be used to prevent marring the surfaces. Pipe wrenches should not be used on hexagonal end valves and fittings, as they will not only cut and scar them, but will also have a crushing effect that may ruin them. This is especially true of valves.

In the case of defects or leaks in small pipes or fittings, it is usually better to renew the pipe or fittings. Repair clamps are available, however, for emergency repairs, as with cast iron pipe, or defects may often be repaired by welding. A liberal use of unions or flanges will facilitate repairs to pipe lines of any kind.

### Welding

Water service gangs will find that welding outfits are admirably adapted to making repairs to pipe lines, especially where they are located above ground or where fittings are involved, such as tees, bends and other fittings, which can be readily fabricated by welding. As a rule, pipe smaller than 1½ in. is not welded, except in emergency, as it is usually more economical to renew the pipe. Pits in pipe, split pipe and other breaks in the larger sizes can often be welded in place more quickly and at less expense than by renewing the pipe. The chief advantage of welding is that repairs or changes in pipe lines can often be made without disturbing the line. For example, if a connection is desired instead of cutting and threading the pipe and installing a tee, a hole can be burned in the main and a nipple inserted, and the line quickly restored to service. In addition, there is a substantial saving in the cost of labor and material.

Gas-Welding a Pipe Line in the Field

The acetylene torch is also useful in melting out the lead in bell and spigot joints in cast iron pipe lines, either when making repairs to or when dismantling such lines. Pipe should not be under pressure where the welding or cutting torch is used, and should be dry. Tobin bronze welding rods are generally used in welding cast iron pipe. Extreme care must be followed in bronze welding or brazing as too much heat will burn out the zinc in the bronze, causing the weld to be spongy, weak and porous. Too much oxygen should also be avoided; a neutral flame is required to prevent the oxidation of the zinc, which will result in a weak weld.

Water hammer is an important factor in the maintenance of pipe lines and is responsible for many leaks in bell and spigot joints, particularly in lines serving water columns. It is induced by the quick closure of a valve or by the sudden stopping from any other cause of the flow in a column of water. Such action causes high momentary pressures with recurrent shocks which subject the pipe and joints to excessive strain. While pipe is rarely bursted because of water hammer, joints are frequently blown out or loosened, and fixtures, and even pumps are sometimes damaged.

Water in motion contains a certain amount of energy depending upon the amount of water and the velocity of flow. If the flow is stopped suddenly this energy must be dissipated in some way. Sudden stoppage of the flow creates a shock pressure that is transmitted through the pipe with constant intensity, the increase in pressure being proportional to the destroyed velocity of the water and the speed of propagation of the pressure wave. The effect of water hammer is particularly severe at bends and when the pressure wave passes into a smaller pipe with a dead end, since the shock pressure is doubled when it reaches the end of the pipe.

Water hammer can be prevented by the use of slow-closing valves. The time in which a valve is closed should be proportional to the length of the pipe line and the velocity of flow. Other methods of overcoming the effects of water hammer are the use of air chambers or relief valves. Air chambers of adequate size, placed near valves, and at other critical points in the line, will help to eliminate hydraulic shock and will not allow the pressure wave to pass through them, but to accomplish the desired effect they must be of ample size. Relief valves provide relief where other means are not available or do not prove effective, as they will intercept and allow such pressure waves as correspond to the elasticity of their valve springs to pass out through them. In other words, the tension of the valve spring should be adjusted to the pressure carried and length of the line in order to be fully effective.

### Effect of Pump on Maintenance

The type and condition of the pump employed will have an effect on the maintenance of pipe lines, particularly where bell and spigot joints are used in the lines. Reciprocating or

plunger pumps may produce intermittent shocks under certain conditions, thus causing damage to the pipe lines and joints unless measures are taken to start the column of water slowly in long discharge lines and thus lessen the shock of the surges inherent where pumps of this type are used. To overcome this, it is customary to follow a practice similar to that used in overcoming the effects of water hammer. Where long pipe lines are involved, air chambers are usually installed in the discharge line immediately ahead of the pump to absorb the shocks due to their pulsations. A by-pass may be inserted between the discharge and the suction and, by opening the by-pass when the pump is started, and then gradually closing it, the column of water may be started slowly without building up excessive pressure. Relief valves serve the same purpose by releasing the pressure until the column of water has been placed in motion.

The principal adverse effects of reciprocating pumps on the maintenance of pipe lines arise from missing pump valves, broken valve springs, or other defects that might prevent all cylinders from becoming filled, thus resulting in irregular pulsations.

A rotary pump, being of the positive displacement type, will start the column of water in full motion as soon as it is placed in operation, but since it creates a steady flow, it will not create surges after the column of water in the pipe is in motion.

Centrifugal pumps build up the pressure gradually and do not produce excessive pressure or surges in the pipe line, either when being started or when in full operation. However, the sudden opening and closing of valves in a discharge line, regardless of the type of pump used, will result in surges that may cause water hammer and damage to the line.

## New Tools for Laying Rail

*(Continued from page 586)*

sponge-rubber hand pads for spike-driver operators, were standard equipment on some roads until the present rubber shortage caused certain of these items to disappear from the market.

While it may appear to some that our rail-laying operations have reached a state of uniform perfection, it is the writer's opinion that following the war many new and improved devices will be made available for use in this work, some of them of revolutionary design.

# Foreman Fails to Flag, Result—106 Persons Injured

ON FEBRUARY 17, 1945, about 1:50 p.m., a passenger train on the Northern Pacific was derailed near Lyons, N. D., when a section foreman failed to provide flag protection while the track was being repaired, resulting in the injury of 99 passengers and 7 employees. The accident occurred on a 3-deg. 30-min. curve where the grade was approximately level and the maximum permissible speed for passenger trains was 55 m.p.h. The scene of the accident was on a section of single-track line extending eastward from Dickinson, N. D., 109.6 miles to Mindan, N. D. The following information concerning the accident is abstracted from the Interstate Commerce Commission report on the accident.

The train derailed, Third No. 2, an eastbound first-class passenger train consisting of the locomotive and 17 passenger train cars, departed from Dickinson at 11:56 a.m., 2 hr. 47 min. late. It passed New Salem, 19.6 miles west of Lyons, and the last open office, at 1:32 p.m., 2 hr. 46 min. late, and a short time later, while running at an estimated speed of 45 m.p.h., was derailed 2.64 miles west of Lyons, the rear wheels of the trailer truck of the engine, the tender, and all but the last car leaving the track. One hundred six persons were injured and the derailed equipment was severely damaged. The weather was clear at the time of the accident.

### Working on Track

On the morning of the accident a section foreman and two men were at work on the curve at the scene of the derailment, having been instructed to correct the gage of the track at that point, which varied from 4 ft. 8½ in. to 4 ft. 9⅛ in. The track structure consisted of 131-lb. rail, 39 ft. long, laid on 22 treated ties per rail length. The rail was equipped with double-shoulder tie plates and was single spiked. The superelevation of the curve was 5 in.

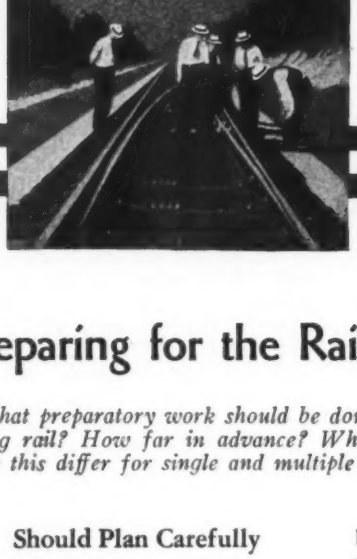
At noon, the force departed for Sweet Briar, N. D., 4.46 miles west of the point of accident, to eat lunch. Before returning to work the foreman received a line-up which showed that Third No. 2 was 2 hr. 30 min. late, and since it was not scheduled to leave Sweet Briar until 11:02 a.m., he determined that it would not pass that station before 1:32 p.m., or the scene of his work before 1:36 p.m.

Resuming work about 1:10 p.m., he instructed his men to pull all the spikes holding the rail to be gaged, and on account of the difficulty encountered in adjusting the rail with its double-shoulder tie plates, he also instructed them to raise the rail on jacks. This work had just been finished and the tie plates relocated, when they heard Third No. 2 coming about three quarters of a mile away. Since they would be unable to signal the train in time for it to stop west of the loosened rail, they hurried to make the track as safe as possible. They were able to drive nine spikes and to remove the jacks before the train reached the rail, however, this number of spikes was not sufficient to hold it in proper alinement and, as a consequence, the train was derailed.

### No Warning Signals

Trains operating over this line are governed by timetable, train orders and an automatic block system. In addition, bulletin No. 3, issued Jan. 1, 1944, provides that flag protection be furnished to prevent trains from entering territory where work is being performed which would render the track unsafe for the passage of trains. Prior to the time of the accident the engine and cars were riding smoothly, and there was no indication of defective equipment or track. The last automatic signal passed indicated proceed. The enginemen, maintaining a lookout ahead, saw members of the track gang as the train approached the scene of the accident, but did not see or hear any warning signals. After the accident a rail on the high side of the curve was found overturned outwardly, and the angle bars at each end were broken.

In the investigation that followed, the section foreman acknowledged that he understood the rules to require flag protection, but that in this instance he thought the rail would be replaced and properly secured before Third No. 2 would arrive. However, he overlooked the time during the progress of the work, and, as a result, Third No. 2 was derailed 14 min. after the time which he had previously estimated as its earliest possible arriving time.



# What's the ANSWER?

## Preparing for the Rail Gang

*What preparatory work should be done in advance of laying rail? How far in advance? Who should do it? Does this differ for single and multiple track? Why?*

### Should Plan Carefully

By C. E. Miller
Assistant Engineer Maintenance, Chicago & North Western, Chicago

Each job of laying rail should be planned carefully in advance of starting the work. There should be close co-operation between the engineering and operating departments to arrive at the best possible arrangement for carrying out the work efficiently, with the least interference with traffic. These arrangements will include the location of temporary crossovers where traffic is to be diverted; where the camp for the extra gang shall be located to insure minimum loss of time for the gang, and where side trackage can best be made available; and the working hours of the gang should be predetermined, so that there will be minimum disturbance of traffic, consistent with economical operation of the rail-laying gang.

The old rail that is to be replaced should be in good line and surface, with low joints tamped in advance, to insure that the new rail will be well supported until it can be surfaced, and in a position where heavy lining will not be required.

Within the limits of the rail replacement, distances shold be measured accurately to determine the location of all turnouts, curves, bridge ends, highway grade crossings and other items that affect the distribution and the laying of the rail. In this way a list can be compiled to show where short rails, switch material and rails of different quality should be unloaded.

All fastenings and track accessories should be unloaded at the time the rail is being distributed, and this material should be placed so that it will be available where wanted, with the minimum of handling for installation. Tie plates should be distributed from the work train in bundles placed on the shoulder of the roadbed. These plates should then be distributed individually between the rails immediately ahead of the laying of the rail. A similar procedure should be followed in the distribution of bolts, spikes, anti-creepers and spring washers.

It is well to install turnouts with a small force working in advance to avoid loss of time by the steel gang, for the loss in man-hours is heavy if the turnout must be installed by the rail gang. Insofar as possible, consistent with the safety of highway traffic, crossings should be prepared in advance, so as to entail minimum delay to the steel gang when it reaches them.

Where the ballast requires an excessive amount of digging down to clear the adzing-machine blades, this should be done in advance of the rail gang, so that only a normal amount of cleaning and sweeping the ties will be required at the time the rail is being laid.

Before starting a rail gang, it is necessary that all machines and accessories that are to be used on the job be in first-class condition, and that an ample supply of fuel, lubricants and other supplies be on hand, for failure to have any of these supplies when needed will disorganize and delay the entire gang and result in the loss of many man-hours. It is important to realize and to keep in mind constantly, when handling a gang of the size usually employed for laying rail, that any move that can be made

---

**Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.**

### To Be Answered in August

1. *What precautions should be observed in the operation of motor cars to reduce the probability of accidents? Who should be responsible?*

2. *What minimum depth below the surface of concrete should be required for reinforcement? Why? Does the character of the structure or the location of the member make any difference?*

3. *When changing the type of ballast, is it better to skeletonize the track or to bury the old ballast and place only enough new ballast under the ties to bring the track to the desired gradient? Why? What considerations are involved?*

4. *Can white lead be used as the finishing coat for bridges and other steel structures? If not, why? If so, what are the advantages? The disadvantages?*

5. *To what extent is it practical to use obsolete and semi-obsolete track materials to avoid ordering new items of critical materials?*

6. *To what extent is it desirable to search for leaks in pipe lines? Should this be done only on obvious evidence of leaks? How can it best be done?*

7. *Should a manganese-steel frog be removed from the track when a crack or partial separation occurs at the point? A rail-bound manganese-steel frog? Why? If not, what can be done to maintain the frog in service?*

8. *To what extent is it desirable to give building materials fire-retardant treatment? Is this affected by the use to which the building is put? By its location? Why?*

that will save a few minutes for the entire gang will make worth-while savings in the total man-hours for the job as a whole.

### Nothing More Important

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

There is nothing more important in connection with the replacement of rail than that of making suitable advance preparation. This work includes a number of items that usually are not associated directly with the laying of the rail, such as the cleaning of ditches, the installation of suitable subsurface drainage where needed, and the restoration of the roadbed. While it is not usually done, it is my belief that any ballast cleaning that is needed should be completed ahead of the rail gang. In general, the sub-drainage, the roadbed restoration and the cleaning of the ballast should be completed not later than early in the fall preceding the installation of the rail.

Obviously, the track upon which the rail is slated for renewal should be in as good line and surface preparatory to entering the winter as any other track. If the rail is to be laid during the winter, however, special attention should be given to both line and surface, to avoid, so far as possible, the necessity for shimming or spike lining the new rail. If it is to be laid in the spring or early summer, a special surfacing gang should precede the rail gang to surface, without a general raise, and line the track, so that the new rail will be given uniform support until the regular surfacing gang arrives, and to minimize the amount of lining that must be done by the rail gang. If considerable correction of the general line is to be made, however, this should be done in connection with the surfacing and renewal of ties subsequent to the laying of the rail.

As a corollary to putting the track in good line and surface, ahead of the replacement of the rail, special attention should be given to the adzing of the ties as the old rail is thrown out. While it is important to carry the adzing to the point where sound wood will be obtained for the support of the tie plate, it is equally important that it shall not be carried beyond this point, partly to reduce to the minimum the necessity for tamping up low ties, and partly to prevent undue destruction of the tie by over-adzing.

If the labor situation is such that the section forces can be increased sufficiently, the light running surfacing and the lining of the track ahead of the rail gang can be assigned to the regular or augmented section gang. This is desirable from several standpoints, the principal of which is that the foreman is familiar with the weak points in his track and with other local conditions that may affect the work. If the surfacing gang follows the rail gang closely, the section gang can be employed to pick up the weak spots that always develop after the track is given a general lift or a considerable number of ties have been renewed.

# Can Ties Be Tamped Too Solidly?

*Can ties be tamped too solidly? Joint ties? Why? How? Does the density of traffic or the speed of trains make any difference?*

### Must Utilize Full Bearing

By Edgar Bennett
Chief Engineer Maintenance of Way and Structures, Southern, Knoxville, Tenn.

If all ties are tamped uniformly, the answer to this question is no; if the tamping is not uniform, the answer is yes. Joint or other ties may be considered to have been tamped too solidly if they leave adjacent ties slack or swinging, which results in rough and damaged track. Overtamping certain ties has a tendency to increase the damage to those ties, overloading the roadbed and developing water pockets, together with the creation of other poor maintenance conditions. With the heavy, high-speed, dense traffic that now prevails, it is important that the full-bearing value of the ballast be utilized by tamping ties uniformly, except for 12 to 14 in. in the center of the track, which should be shovel filled.

### Support Must Be Uniform

By C. D. Turley
Engineer of Ties and Treatment, Illinois Central, Chicago

Earth subgrade, thoroughly drained; prepared ballast of stone, slag or other suitable material; together with well-seasoned crossties of standard dimensions, provide a satisfactory, resilient and ample track support. Uniformity of support and exactness of cross level in tamping are the prime requisites for good-riding track. If the ballast is tamped thoroughly under the ties, using present-day mechanical tamping equipment, and following improved methods and practices, excellent and economical support for the track can be obtained.

Dense traffic and high-speed trains increase the wear and tear on the track, since more and harder blows from the passing wheel loads must be absorbed. Under these conditions it becomes necessary to surface and resurface the track at shorter intervals than where lighter traffic and lower speeds are encountered. This discussion is limited to the prepared ballasts that are especially suitable for extremely heavy traffic. Gravel, chats, locomotive cinders and some other materials make excellent ballast, but are not included for consideration here.

It has been a somewhat general practice to tamp joint ties more thoroughly than intermediate ties, because of the severe service the joint must render. Furthermore, on multiple tracks, the ties under the receiving end of the rail are tamped more solidly. It is a well-established fact that joint ties require more attention than intermediate ties.

The ballast should be tamped thoroughly to insure as much service as possible before retamping, but the hardness and toughness of the ballast itself determines how solidly it should be tamped. If the ballast is crushed or pulverized into small particles, quick drainage is hampered and one of the main functions of the ballast has been lost.

### It Is Poor Practice

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

This question touches upon a practice that should be given more consideration than is oftentimes devoted to it, for it is one of the worth-while subjects connected with track maintenance. It is the purpose of practically all foremen engaged in track maintenance to have their men tamp all ties alike, that is, to a uniform bearing throughout the rail. While intermediate ties can be brought to a satisfactory and uniform bearing by lock tamping, it is necessary to tamp joint ties from both sides if they are to withstand the impact of the wheel loads as they pass over the rail ends.

On the other hand, where the rail ends are battered, it is not uncommon for the foreman to go back after a few trains have passed over the newly-surfaced track and give the joints a second raise, crowning them slightly. Where this is done, the joint ties are tamped too solidly and, invariably, the adjacent ties will not bear fully on their beds. Not infrequently this causes the rail to break, or the joint bars may be broken. Apparently the speed of trains has some influence on the breakage of rail where this form of tamping is done.

So far as I have been able to observe, the density of traffic or the speed of trains, except as already noted, has no influence on the way the tamping should be done or on the probability that the ties will be tamped too solidly. Where care is exercised to insure that the ties are tamped uniformly, it is obvious that no ties will be over-tamped. It is equally obvious that where the tamping is not done uniformly, some ties, by comparison, will be over-tamped, while the remainder will be under-tamped. Compacting the ballast a little more carefully under the joint ties does not constitute over-tamping, unless the tie is humped, in which case it may be said to be tamped too solidly.

# Should Piles Be Seasoned?

*Should creosoted piles be allowed to cure after treatment? Why? How long?*

## Sees No Reason for It

By A. R. Harris
Assistant Engineer of Bridges, Chicago & North Western, Chicago

It is not quite clear what the word "cure" is intended to mean when applied to the art of wood preservation, but assuming it to mean a procedure for changing the moisture content of the wood, there appears to be no evidence based on experience, or reason based on theory, why a treatment process should be worked out to include seasoning after treatment. Furthermore, when green piles are quick-seasoned and there is a large amount of moisture in the pile after treatment, it is doubtful whether there is any method of correcting this condition by after-seasoning, that will produce as good results as sufficient seasoning before treatment. If the piles have an excess of moisture after treatment, they will increase in strength for static loads if they are stored for several months in a dry atmosphere after treatment, to evaporate some of the internal moisture.

Information obtained from the field forces indicates that purchased creosoted yellow pine piles conforming to recognized standard specifications are being driven successfully, although there have been a few instances where checking and ring shakes have developed while the piles were being driven. The defects observed in some creosoted piles years after they were placed in service, include checking, splitting and hulling, that is, complete cleavage of the outer ring of sapwood from the inner core of heartwood extending along the pile.

Those reported defects of piles after they have been driven seem to indicate the need for a better method for quick-seasoning than the steam-seasoning method used on green southern pine piles. As a result of this method of seasoning, internal stresses are set up between the outer ring of creosoted sapwood and the inner core of heartwood when the moisture finally evaporates. There has appeared in recent literature a description of a method for the quick-seasoning of green timber by drying it in warm air before treatment, which is claimed to be successful in eliminating defects due to steam seasoning.

## Sees an Advantage

By L. G. Byrd
Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

There are some advantages in allowing creosoted piles to cure after treatment, but whether the period necessary for this can be allowed will depend entirely upon the supply and demand. If the supply of piles on hand is sufficient to permit a three-months curing period on after treatment, especially during the summer, it will reduce the fire hazard which always attends creosoted timber, especially for the first few months after treatment, because of the high flammability of the oil that oozes to the surface, even where the Rueping process is employed and the surface is steam cleaned after treatment. This applies to all other creosoted material, as well as to piles.

Curing after treatment will also reduce the hazards of handling the piles in the field, as practically all treated material in bridges requires some handling by hand. With freshly-creosoted piles or timber, the surfaces are slippery, making them much more difficult to handle.

One precaution that should be observed in curing after treatment is to avoid storing the piles on yard until all bleeding has stopped, since considerable benefit is derived from driving piles from which the oil is still oozing. The reason for this is that after the piles have been driven, the oil which bleeds out forms a ring of oil around the pile at the ground line. This tends to prevent vegetation from growing and will have some effect in preserving the material, since it will discourage the growth of fungi that so frequently attack timber and poles at the ground line. This ring of creosote-soaked earth should never be removed or disturbed.

It has been my experience in applying creosoted timber, especially piles, that when they are allowed to rest too long on skids, the top of the timber dries out quite thoroughly and, in some cases, checks or splits, allowing water to penetrate the material. This is particularly true of treated fir.

## Less Fire Hazard

By S. F. Grear
Assistant Engineer of Bridges, Illinois Central, Chicago

Creosoted piles which have had a long period of seasoning after treatment will have some of the surface oil drained off, making them easier to handle, while there is less tendency to burn the skin of the men who handle them. Probably there is also less danger from fire when the piles have been stored for a season for drying.

To accomplish anything along the foregoing lines, I believe that at least two years storage would be necessary, and this is not practical. On this road most of the creosoted piles go into stock at the treating plants and are ordered out as required. Naturally, this results in a considerable period of seasoning for most of the piles. I do not believe that a seasoning period will add to the life of the pile.

## Should Always Cure

By General Inspector of Bridges

It is always more satisfactory to handle and apply creosoted material, including ties, piles, construction timbers and lumber, if it has been placed

on yard immediately after treatment and allowed to remain until the surfaces have dried enough so that they are not slippery. Men handling freshly creosoted material are exposed to creosote burns wherever fresh creosote comes into contact with the skin. Light-complexioned persons are much more sensitive to this form of burn than those that are dark complexioned.

I have driven many piles, and have seen many others driven, that were loaded into cars directly from the retorts and shipped immediately. Some of them had scarcely lost the heat of treatment by the time they were placed in the leads of the driver. As they were driven the surface creosote, and probably some of that from the cells immediately below the surface, was spattered all around with each blow of the hammer, as the wood compressed or vibrated under the blows. I have seen men with their faces, arms and clothing spattered with creosote and have known of several rather severe eye injuries until we learned to wear goggles. I have also driven many piles that have been allowed to cure before shipment, and I have never seen a creosote burn from the handling or driving of such piles.

Freshly-creosoted timber presents a serious fire hazard, which diminishes rapidly as the surface dries. In the course of time the creosoted surfaces are more difficult to ignite than untreated surfaces. I am familiar with several cases where freshly-creosoted material was installed in structures that burned within a few days of completion. I have known of fewer fires in structures that were built of materials that have been allowed to season, and none of these was serious. I have also known of freshly-creosoted piles that were ignited and consumed shortly after unloading, before the section gang doing the work could get on the ground and cover them with dirt.

# Water for Diesel Locomotives

*What facilities should be provided for the delivery of water to Diesel locomotives? Where should they be located? What considerations are involved?*

## Must Time Closely

By Engineer of Water Service

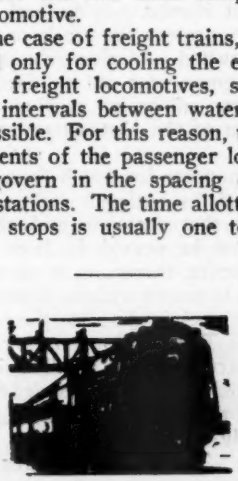
Among the items to be considered are (1) the number of units comprising the locomotive; (2) the amount of water required at each watering point; (3) whether the facilities are to serve freight, passanger or switching locomotives, or a combination of two of them; and (4) the time available for taking water. The water-storage capacity varies from 1,200 to 2,400 gal. per unit on freight and passenger locomotives, and from 135 to 650 gal. on switching locomotives.

The water consumed by passenger locomotives is greater than by freight and switching locomotives, since each passenger car will require from 16 to 20 gal. an hour for heating, in addition to the cooling water for the engines. Assuming an average speed between terminals of 50 miles an hour, a locomotive with water storage of 2,400 gal. pulling an eight-car train, should have sufficient water capacity for a 750-mile run. On this basis, water facilities located at intervals of 300 to 400 miles, should provide a wide margin of safety for a train of this size. It is the general practice, however, to space the facilities at shorter intervals. One road that operates an eight-car Diesel train over a route of 900 miles has provided watering facilities at nine intermediate stations where the train stops, an average interval of about 90 miles.

This arrangement permits selective stops to be made in each direction or, the taking of less than the full storage capacity at regular stops, to avoid delay, instead of at longer intervals, when more time would be required for each stop. At the principal stations, where fuel oil is taken as well as water, the rate of delivery is 300 gal. a min., a booster pump being installed where necessary to insure this rate, duplicate delivery being provided for the two units comprising the locomotive.

In the case of freight trains, water is used only for cooling the engines of the freight locomotives, so that longer intervals between water stops are possible. For this reason, the requirements of the passenger locomotives govern in the spacing of the water stations. The time allotted for station stops is usually one to four minutes, so that the watering operations must be timed to make every second count if schedules are to be maintained.

Supplying water to switching locomotives does not present any special difficulty, since the water consumption is low and the time restrictions on delivery of the water are less severe. Where Diesel road locomotives are fueled and watered at terminals, the time allowed for turning the locomotive is usually short and much work, including routine inspection, cleaning and running maintenance, must be crowded into this short period. To conserve this limited time, the water and fuel should be taken while the locomotive is at the washing rack or on the inspection pit.



## Requires Careful Planning

By P. H. Geelhart
Assistant Engineer, Chicago, Milwaukee, St. Paul & Pacific, Chicago

The problem of providing water facilities for Diesel locomotives that are used in passenger-train service requires considerable attention to design and careful planning. The location of water stations and the quality of the water are both factors that affect operating efficiency, so that an investigation of available supplies should be made with the view of selecting the most favorable locations and the best water available. The location of water columns, the size and length of supply lines, together with the delivery in gallons per minute, have been important factors in providing water for steam locomotives at both terminals and intermediate water stations. In general, these same requirements apply to facilities for watering Diesel locomotives, particularly those on high-speed trains.

Passenger trains pulled by steam and Diesel locomotives normally make the same stops to receive and discharge passengers. This favors the installation of Diesel watering facilities near existing water columns or tank spouts. The modern Diesel passenger locomotive has a water-tank capacity of from 1,050 and 1,600 gal. per unit, or from 2,100 to 3,200 gal. per locomotive. Passenger-car requirements approach a maximum of 300 lb. of steam or 36 gal. of water per hour for air-cooling, with somewhat smaller requirements for heating. It follows naturally that the capacity of the facilities must be governed by train length and maximum requirements.

By installing quick-acting valves and hose with couplings that can be attached easily at either end, sufficient water can usually be supplied for nor-

mal requirements during station stops. To eliminate the use of long hose, it is advisable to extend supply lines so that hydrants can be located near each locomotive intake. Where hydrants are so placed, only a short length of hose is required for each Diesel unit. This also facilitates handling and storage. The quality of the water delivered has a direct bearing on the cost of maintaining the heating units of Diesel locomotives.

# Dimensions for Tamping Bars

*What are the most suitable dimensions for the face of a tamping bar for use with tie tampers? For tamping blades? Why? Does the kind of ballast or the amount of the raise make any difference? If so, what?*

## Depends on Ballast

By District Engineer

Tamping bars and blades are made in a wide variety of sizes and face dimensions to meet the different conditions of ballast and lift and, to some extent to conform to individual ideas of what is required of a tamping tool. As a result, the thickness of the tamping face of the bars ranges from ⅜ to 1½ in., and the length from 3 to 9 in., while the faces may be plain or toothed. In general, ⅝ and ¾-in. faces, in the narrower widths, are preferred for tamping stone ballast. Widths up to 6 in. are employed more commonly for gravel ballast, with faces ¾ to 1 in. thick. Bars of similar thickness and in widths up to 9 in. will give better results in cinders, fine chats, screenings and other soft ballast material; and when making the first lift of a general raise.

What are known commonly as step-out blades are most satisfactory for spot tamping and for general use in cementing gravel. For higher raises, particularly lifts exceeding 3 in., the wider blades give better results, as do narrow blades for less than 3 in.

## Must Not Destroy Ballast

By W. H. Sparks
General Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Tamping-bar faces must be large enough to assure that the ballast will be forced into place underneath the tie, without causing it to split, spall or pulverize. If the tamping is to compact the ballast solidly enough to give the tie a dependable bearing that will hold the surface, it must do so without breaking it up or otherwise damaging it.

If stone ballast is tamped until it is pulverized, it not only will not support the track to a good surface, but it will become foul and block the drainage that is so essential to good track. To avoid this the faces of the tamping bars must not be thin, but of such dimensions that they will compact the ballast without damaging it. Stone ballast becomes foul and dirty soon enough under favorable conditions, and every effort should be made to avoid using equipment that will hasten the fouling. On the other hand, in spot surfacing, the raise is frequently so small that a relatively thin but long tamping face is required to avoid making too much of a raise, or its alternative—disturbance of the tie bed.

Tamping blades can be thin for any kind of ballast. Care should be exercised in using them, however, for unless used correctly, they can do harm to the bed of ballast under the tie, unless the raise is sufficient to allow the ballast to be placed freely under the ties. Well-experienced labor should handle the tamping, since it requires experience to know when the space under the tie is full.

In view of the density of traffic that is now moving, we must pay more attention to the height of the raise than we have been doing. The track that is being worked should be given sufficient raise so that the ballast can be placed quickly and easily, allowing the trains to do a considerable part of the compacting of the ballast under the ties.

# Sending Out a Flag

*Is it permissible to send out a flagman, with instructions to return at a given time or after the passage of a certain train? Why? If not, how should he be recalled? What precautions should be observed?*

## It Is Not Permissible

By G. P. Palmer
Engineer Maintenance and Construction, Baltimore & Ohio Chicago Terminal, Chicago

Maintenance-of-way flagging rules generally provide that when dangerous defects of track, roadway, bridges or tunnels are found, or when work is to be done that will obstruct the track or render it unsafe for the passage of trains, flagmen will be sent out immediately in both directions to protect the track or tracks so obstructed. Another rule provides that flagmen sent out to flag trains must stop all trains moving in the direction of the obstruction until recalled.

The purpose for which flagmen are employed, as outlined, makes it imperative that complete and absolute protection be provided. It is not a safe practice, therefore, to permit the flagmen to return without instructions that the track is clear for the passage of trains. There are numerous reasons why instructions for recalling a flagman should be enforced strictly.

First, there is no absolute certainty that only certain trains have to be stopped. This is true particularly when contact with the dispatcher cannot be made or maintained easily. Second, the time element is also uncertain, as to when the obstruction or the unsafe condition will be removed. Third, any instruction other than to stay until recalled might be misconstrued or might confuse the flagman, so that full protection might not be provided.

Considering the quality of the employees that we now are compelled to use as flagmen, it is vital that their instructions be as simple as possible, so that there will be no possibility of a misunderstanding between the foreman and his flagman.

There is no good or sufficient reason for making any exception to the practice of requiring a flagman to stay on the job until he is recalled. What little saving might be accomplished will be offset by the increased factor of safety that is provided. It is essential that safety first be the prime consideration where flagmen are employed.

This discussion is based on conditions found in a large and busy terminal, where train movements are numerous and where many of them are not scheduled. It may be that there are conditions on other roads

where train movements are infrequent, that might justify some modification of the rule regarding the recall of a flagman, but I would hesitate to recommend anything different from that outlined.

### Rules Are Specific

By Engineer of Bridges

If a flagman is necessary it is obvious that the track is unsafe or is to be rendered unsafe for the passage of trains. If the flagman has been instructed to return at a given time, it is equally obvious that the foreman doing the work is estimating that he will complete his work and restore the track to a safe condition within a certain period. It is entirely possible and, in fact, highly probable that it may take longer to make the track safe than he estimated that it would. The time element also enters into the flagman being relieved after the passage of a certain train. In such a case, it would be necessary to stop that train to identify it.

Standard operating rules are quite specific, requiring that flagmen be relieved only by another flagman or released from duty only by word of mouth or written instruction from his foreman. This is the only safe way to protect a point where the track may be unsafe for normal speed. One of the favorite catch questions of rules examiners is to ask a flagman whether he would leave his post upon a hand signal from the foreman.

# Painting Enginehouse Walls

*Is it desirable to paint the interior wall surfaces of enginehouses and shops white? Why? How can this be done? How can they be kept white?*

### Considers It Desirable

By G. S. Crites
Division Engineer, Baltimore & Ohio, Baltimore, Md.

It is reported that $18,000 spent in painting the interior walls white in a large airplane factory was more than offset by a reduction in the electric-lighting bills over a period of 4½ years. This was an old factory in which the lighting conditions were quite similar to those in railway shops and enginehouses. The painting increased the daylighting as much as 2½ times for some of the machines.

In addition to the better lighting that is accomplished, white walls and ceilings give a neater and tidier appearance and seem to cause the workmen to be more careful in all respects. Walls and ceilings should be painted with a good grade of flat oil paint from the ceiling to about 6 ft. above the floor level, and with a similar grade of gloss oil paint from the 6-ft. line to the floor. The lower section or dado does not reflect much light and the color can be light tan or gray, which will not show soiled spots as readily as white. The white surface above the dado can be kept reasonably clean by dusting it with an air blast and an occasional washing.

The interior surfaces of both enginehouses and shops can be spray painted if the work is done carefully. Owing to the inconvenience that cannot be avoided entirely while the paint is being applied, the best and most lasting paints obtainable should be employed and applied by the best painters available. With good paint and good workmanship the paint should last from five to seven years.

### Do Not Use Whitewash

By A. L. McCloy
Supervisor Bridges and Buildings, Pere Marquette, Saginaw, Mich.

Going back somewhat into our past experience, it was our practice for many years to paint all interior wall surfaces of shops and enginehouses, including the ceilings, with a whitewash made with the sediment from used carbide tanks. This burned-out carbide is a high-grade lime. This practice was discontinued finally, because the whitewash was too messy. It flaked off when the windows or doors were open during warm weather, and covered everything in the building with a flaky white dust.

Since we discontinued the use of the whitewash we have not attempted any substitute treatment for enginehouses, but we do paint the interior surfaces of shop buildings with a good quality of white paint, provided these buildings are not connected directly with enginehouses. After painting, the walls can be washed or dusted off as required with a jet of compressed air.

The interiors of such buildings as machine shops and electrical shops, in which all types of running-repair parts are made, are painted. Steel sash is painted inside and outside on an average of once every two years, partly to add to the lighting and partly to protect the steel against corrosion. We paint with both brushes and spraying equipment and keep the surfaces clean more by dusting with air than by washing.

### Prefers Aluminum Paint

By A. G. Dorland
Assistant Engineer, Elgin, Joliet & Eastern, Joliet, Ill.

Aluminum paint is preferable for painting the interior wall surfaces of enginehouse and shops. If this paint is not available, white paint may be used. Either one will make the shop lighter and may save some expense in artificial lighting. I believe that such painting provides better working conditions since it tends to remove the dark spots where materials are likely to be placed and become a safety hazard.

It may be impracticable to do much cleaning of the painted walls, but under ordinary conditions the workmen will keep the white walls cleaner than they would dark or unpainted walls. If it is undesirable to attempt to clean these walls, one coat of paint will brighten them up for some time.

### Will Improve Lighting

By General Building Inspector

Painting the interior wall surfaces of enginehouses and shops, including power plants, with white or light-colored paint, has a number of advantages. The lighter colors improve lighting conditions, promote cleanliness, help the appearance of the shop, improve the morale of the employees and reduce accidents. While white is perhaps the most effective from the standpoint of lighting, it is difficult to keep clean, particularly in enginehouses where the atmosphere is constantly being charged with smoke and soot, so that the painted surface soon becomes smudged. Even where there is an effective smoke-removal system, white walls soon become dingy and dirty in appearance. Some roads

whitewash the interior of enginehouses and shops, especially when the walls are of brick. The whitewash is usually applied with a spray, necessitating the protection of machinery, other equipment and locomotives, while the whitewash is being applied. Obviously, the whitewash is suitable only for application to the brick and wood surfaces; steel columns and truss members must be painted with a good grade of paint. Whitewash is more susceptible to smudging with dirt than a good paint, and it must, therefore, be applied at shorter intervals. Yet, repeated applications result in flaking off of the whitewash, thus creating an unsightly appearance of the walls and ceiling, making it more difficult to keep the equipment clean.

More careful thought should be given to the painting of the interiors of shops and enginehouses, especially as to the colors used. For example, grays and buffs may be employed to advantage on walls, with a light yellow on cranes, posts and other fixtures. These contrasting colors not only tend to make these members and fixtures stand out in bolder outline, but they also tend to increase the effectiveness of the lighting system and to improve working conditions. This contrasting color scheme can be extended to machine tools, which are usually painted a conventional battleship gray. Painting and lighting authorities are in agreement as to the application of contrasting colors on machine tools, in both increasing efficiency of the operators and in reducing accidents.

# Painting Galvanized Gutters

*Is there any advantage in painting the interior surfaces of galvanized gutters with asphalt or coal-tar paint? Any disadvantages? Why? When should it be applied? Do such coatings hinder or facilitate repairs?*

## Prefers Red Lead

By E. H. Barnhart
Division Engineer, Baltimore & Ohio, Garrett, Ind.

As they were produced prior to the changes required in the galvanizing process by emergency conditions, galvanized gutters were applied without any inside or outside coating. They would last for ten or more years, depending on the character of the roof and the location of the building. When applied to railway buildings adjacent to main tracks, where there is normally a considerable deposit of front-end screenings, the life of the galvanizing surface is somewhat shortened. I have never considered it desirable to paint the original galvanized gutters until such time as the galvanizing begins to show signs of wearing off.

I believe that red lead will serve the same purpose as the asphalt or coal-tar paint. The red lead acts as a rust inhibitor and saves the steel under the galvanized coating as well as asphalt, and, as asphalt is usually a thick and pasty preparation, there is a disadvantage in using it in gutters, because of its tendency to catch small particles and gradually cause a stoppage in the gutter. There is also a disadvantage with respect to the matter of making repairs to gutters for the same reason.

Present-day galvanized surfaces will require painting much sooner than the pre-war galvanized surfaces, but I do not consider it desirable to paint these gutters when they are applied. It is the business of the bridge and building department, particularly of building inspectors, to watch gutters and, in the event that they show evidence of the galvanizing wearing off, they should be given a coat of red lead.

## Advocates Asphalt Paint

By J. L. Varker
Supervisor Bridges and Buildings, Delaware & Hudson, Carbondale, Pa.

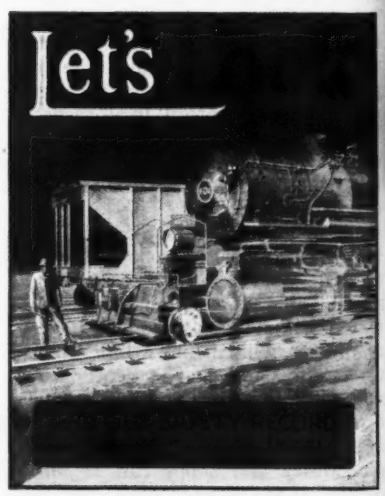
Experience has shown that there is a decided advantage in painting the interior surfaces of galvanized gutters. The advantage to be gained by this action is obviously prolongation of the life of the metal from which the gutter is made. Different kinds of paint have been used for this purpose, but the best results have been obtained from the use of asphalt paints, particularly one containing some long asbestos fibre. Such a paint should remain elastic, even during cold weather, to be serviceable and require the least maintenance over the longest period of time. Paint that becomes brittle during cold weather is likely to check and crack and become loose in places, leading to loss of its protective qualities.

This is more likely to occur with coal-tar paints than with asphalt paints. A test has been made on a structure, in which some of the galvanized gutters were painted with an asphalt paint, while the remainder were left unpainted. The life of the unpainted gutters ranged from eight to ten years, while the painted ones are still in service and in good condition after 23 years, and with no other treatment than that provided by the original painting.

The painting may be done either before or after the gutters are put in place. It is usually easier to paint them before they are hung, for in this way a better job of painting can be done. In doing this, however, the paint should be kept back from the joints until the gutters are assembled in place. The metal should be warm before it is painted, as the paint will spread more easily and more smoothly than if the surfaces are cold. It is also desirable to do the painting several days in advance of putting the gutters in place. This will allow the paint to set somewhat before it must be handled.

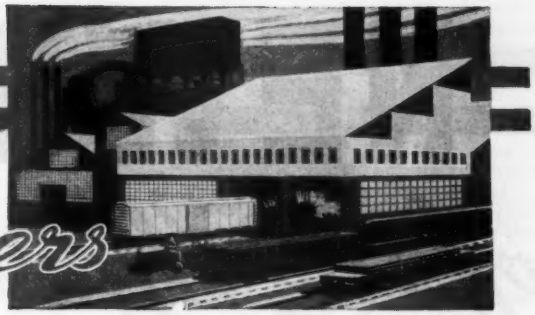
Repairs are not hindered to any appreciable extent by painting. In fact, they may be facilitated. For example, if small holes have developed in the gutters, they can be bridged over by applying an additional coat of the paint, since it is viscous enough for this to be done. If the holes are larger, they may be repaired by cementing pieces of metal over them with the paint. If it becomes necessary to do any re-soldering at the joints, they will have to be cleaned first by scraping. Cleaning off the paint from the joints will not create any material hindrance in making the repairs.

---



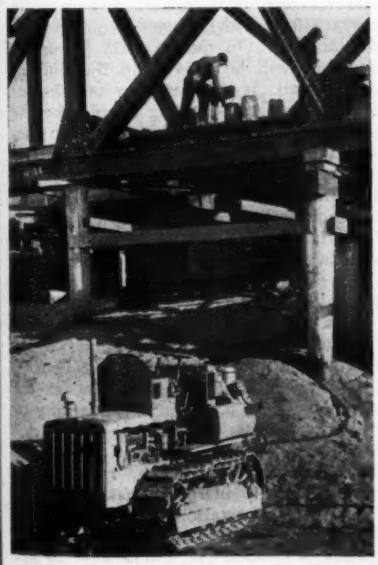

**This Poster, No. 261, Constitutes the June Installment of the "All the Year—Every Year Safety Program" of the Safety Section, Association of American Railroads**

# PRODUCTS of Manufacturers



## Jaeger Compressors

The Jaeger Machine Company, Columbus, Ohio, is now producing a line of portable and stationary air compressors in which the portable models are available in capacities ranging from 60 cu. ft. to 315 cu. ft., inclusive. Particularly adaptable to railroad maintenance work is a model that is specially designed for mounting on Caterpillar or International crawler tractors. Known as the Travel-Air model, this unit is available in capacities of 160, 210 and 315 cu. ft. Other portable models may



**Jaeger Travel-Air Compressor Mounted on a Caterpillar D-4 Tractor**

be had with truck, skid or trailer mountings.

By balancing the low and high-compression cylinders in a "W"-shaped bank and by micro-honing the cylinders and lapping the valves to close automotive tolerances, the resulting efficiency in the new compressors is said to permit full-rated output of air with lower piston speed. Advances in air cooling derived from war experience have been incorporated in the machines to simplify control of the heat and condensation. Air-animated "Swedish twin" valves of large size and high lift are said to permit free air flow without back pressure. Condensation and oil vapor are controlled by the automatic unloading and draining of the corrosive fluid during each idling period.

The "W" arrangement of the compressor cylinders is said to permit the use of a short crankshaft and closely-spaced main bearings, and also to provide easy access to the valves and parts. Valves and pistons are interchangeable throughout. The units have forced-feed lubrication, the bearings and twin disk multiple clutches are designed for life-time service, and group control panels, large air receivers, sectional radiator grills, extended lubrication fittings and protected fuel tanks are standard features.

It is claimed that the valve action, in combination with improved cylinder radiation and efficient intercooling, permits the temperature of the compressed air to be held within 100 deg. of the temperature of the atmosphere, thus, it is said, eliminating both the danger of overheated tools and the pressure losses occasioned by sharp drops in temperature in long air lines.

## Two Stanley Unishears

The Stanley Works, Stanley Tool Division, New Britain, Conn., has developed two new Unishears, designated as Models No. 208 and 214, which are said to be particularly adaptable in railroad service for cutting sheet metal in steel fabricating and repair shops. Model No. 208 is 18 in. long and weighs 36 lb. while Model No. 214 is 10¾ in. long and weighs 8½ lb. Both units are designed for one-man operation.

Each of the new models is powered by a universal-type electric motor operating on either alternating current or direct current of 60 cycles or less. Both tools include the following features: Adjustable alloy steel blades; a duplex handle, which is said to permit the operator to grip the tool in a convenient position; a three-wire rubber-covered electric cable, which is protected by means of a flexible metal sheath; full ball-bearing construction; a heat-treated steel yoke; and a lightweight housing.

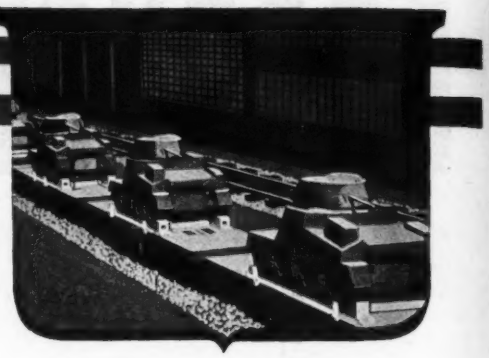
**The Model 214 Unishear**

Model No. 208 can be obtained for operation with 115-volt, 230-volt and 250-volt current, and it is said to be capable of cutting 8-gage mild hot-rolled steel up to a speed of 10 ft. per min. Model No. 214 is available for use with 115-volt, 220-volt, 230-volt and 250-volt current. This model is said to be able to cut 14-gage hot-rolled steel up to speeds of 15 to 20 ft. per min. Both units, it is claimed, can make straight or curved cuts, and can be easily moved to the point of use.

---

APRIL FREIGHT TRAFFIC—The volume of freight traffic handled by Class I roads in April amounted to 62,300,000,000 ton-miles, according to a preliminary estimate based on reports received by the Association of American Railroads. The increase over April, 1944, was 2,012,014,000 ton-miles or almost 3½ per cent. During the first four months of this year these roads handled 238,908,101,000 net ton-miles of freight traffic, a decrease of 3,845,425,000 ton-miles, or 1.6 per cent, as compared with the same period of 1944. However, the traffic handled in the first third of this year showed an increase of 4 per cent as compared with two years ago.

# NEWS of the Month



## Awarded Egleston Medal

Richard Erwin Dougherty, vice-president of the New York Central and an engineer by training and experience, has been awarded the 1945 Egleston Medal of the Columbia University Engineering Schools Alumni Association for "distinguished engineering achievement," which was presented at the seventy-fourth annual dinner of the engineering alumni at New York on Thursday, Auril 19. Mr. Dougherty was cited as an "eminent, resourceful and progressive railroad builder and executive, developing and perfecting the American system of railroad transportation, and carrying forward as engineer and public spirited citizen the spirit of service and accomplishment of a great profession."

## RRs to Offer Buses Fight

"The railroads give every evidence that they are coming out of the pushover class and intend to go after business with everything they've got," Earl F. Theisinger tells intercity bus men in the April issue of "Bus Transportation." In this article, "Watch the Railroads," Mr. Theisinger reminds his readers that the recent Pullman-Standard exhibit in New York, displaying three-tier sleepers, recreational club lounge, "Threedex" commuter car, diagonal dining arrangements, etc., was clear proof that tomorrow's trains "are being planned with an eye to attracting not only the luxury trade but every-day Mr. and Mrs. America."

## RR Safety Winners Announced

Accidental death rates among their employees were reduced 26 per cent in 1944 by six Class I railroads which, on May 16, were declared winners in the Railroad Employees' National Safety Contest of the National Safety Council. The Class I railroads as a group reduced their accidental death rate from 0.27 per million man-hours in 1943 to 0.24 in 1944, although total casualties increased from 11.81 per million man-hours in 1943 to 11.95 in 1944.

Individual railroads which were winners in their respective groups were: 50,000,000 or more man-hours worked—Union Pacific, with a casualty rate of 4.59; 20,000,000 to 50,000,000 man-hours worked—Michigan Central, with a rate of 4.63; 8,000,000 to 20,000,000 man-hours worked—Duluth, Missabe & Iron Range, with a rate of 1.17; 3,000,000 to 8,000,000 man-hours worked—Colorado & Southern, with a rate of 6.46; 1,000,000 to 3,000,000 man-hours worked—Lake Superior & Ishpeming, with a rate of 3.11; less than 1,000,000 man-hours worked—Pittsburg, Shawmut & Northern, with a rate of 6.28.

## R. I. and Milwaukee Open New Missouri River Bridge

The Chicago, Milwaukee, St. Paul & Pacific and the Chicago, Rock Island & Pacific, on June 1, placed in service their new Harry S. Truman bridge across the Missouri river, at Kansas City, Mo. Named in honor of President Truman, a long-time resident of Kansas City, the bridge was dedicated on May 23.

The new structure, which carries a single track, is 2,541 ft. long and consists of four steel through truss spans, of which three are 250 ft. long, and one, a lift span, is 420 ft. long; and seventeen 78-ft. and one 45-ft. steel deck-girder spans. The bridge is of the "low level" type, the river passageway being provided by the vertical lift span, which, when opened, provides a 400-ft. clear channel, with a vertical clearance of 70 ft. above low water. The bridge is designed for Cooper's E-72 loading and will handle the heaviest engines now in use on the lines of either of the two owning railroads.

## Army, ODT and AAR See No Let-up in Rail Traffic

Spokesmen of the Army, the Office of Defense Transportation and the Association of American Railroads are unanimous in their opinions that the next few months will see the railroads faced with their most difficult task since the beginning of the war. These men express the opinion that V-E Day has intensified the rail transportation problem rather than relieved it.

According to Major General Charles P. Gross, chief of the Transportation Corps, the problem of logistics and supply resulting from stepping up the pace of the war with Japan while the return of men and materials from the European theater is underway, leads him to the conclusion that "from a supply and transportation standpoint, the hardest part of the struggle still looms ahead."

General Gross explained that about 3,100,000 men will be withdrawn from Europe within about a year, and that the great majority will come to the United States, either for discharge or for furloughs at home and retraining before being sent to the Pacific theater of war. In either event the movement of such a vast number of men in so short a time is expected to throw an additional strain on over-burdened railway passenger facilities.

In a similar statement, J. Monroe Johnson, director of the Office of Defense Transportation declared: "The next 12 to 15 months will be the most critical in the history of American transportation . . .

"All forms of transportation have for the past three years caried the heaviest freight and passenger burdens in the country's history. They have been strained to the utmost. Now seriously short of materials and equipment and skilled manpower, these facilities must continue to carry a load which shows no prospect of diminishing. On the contrary, transport demands will be heavier in the difficult days ahead. It will be many months before our coastal shipping again takes its share of the country's freight traffic; before the tankers carry the greater part of our oil products to the East coast; before inter-city automobile passenger traffic regains its pre-war volume. In the meantime, rail, highway, and inland waterway transport must continue to bear these extra burdens in addition to carrying military materiel and personnel."

In a similar vein, Warren C. Kendall, Chairman of the Car Service Division of the Association of American Railroads, told shippers that V-E Day "means the start of a new phase in the handling of troop movements by rail in this country." Mr. Kendall's statement anticipates unusually heavy calls on the railroads to provide greatly increased passenger and freight transportation for the armed forces, plus continued movements of large quantities of food and supplies to the Atlantic ports for export to the stricken peoples of Europe.

On the other hand, the end of the European phase of the war has brought some easing of the materials and man-power situations. Already W.P.B. easing of restrictions on many steel items used by the railroads, including those on structural steel shapes, rails and track accessories, and carbon steel plates, have been announced, and it is expected that additional restrictions will be lifted before July 1. However, in speaking of the removal of restrictions on certain items, W.P.B. director Krug warned that revocation of particular restrictive orders will not necessarily mean immediate resumption of civilian production of affected items.

# Changes in Railway Personnel

## General

**G. R. P. Graham,** roadmaster on the Canadian National, at Regina, Sask., has been promoted to assistant superintendent, at Dauphin, Man.

**E. L. Banion,** general foreman on the Atchison, Topeka & Santa Fe, at Topeka, Kan., has been promoted to assistant division superintendent, with headquarters at Needles, Cal.

**George DeCamp Hughey,** superintendent of transportation of the Delaware & Hudson, and an engineer by training and experience, has been promoted to assistant general manager, with headquarters as before at Albany, N. Y.

**F. E. Bates,** chief engineer of the Missouri Pacific, at St. Louis, Mo., has been promoted to executive assistant, with the same headquarters. **R. P. Hart,** assistant chief engineer, has been advanced to chief engineer, with headquarters as before, at St. Louis, replacing Mr. Bates in that capacity.

**Sidney Lloyd Mapes,** whose promotion to assistant general manager of the Central Railroad of New Jersey, at Jersey City, N.J., was reported in the May issue,

Sidney Lloyd Mapes

was born at Port Jervis, N.Y., on June 15, 1890, and entered railroading with the Erie as assistant foreman (student) in the track department at Carlstadt, N. J., in 1911, joining the Jersey Central in August of that year as rodman. He transferred to the maintenance of way department in July, 1913, as an engineering clerk, and was appointed chief material inspector on November 29, 1915. In June, 1918, he was named assistant supervisor of track, becoming assistant engineer in 1920 and assistant engineer maintenance of way in 1923. Mr. Mapes was promoted to engineer maintenance of way of the Central division in August, 1926, and in July, 1932, he was further advanced to engineer maintenance of way at Jersey City, N. J., with jurisdiction over all divisions, the position he was holding at the time of his recent promotion to assistant general manager.

**William H. Jones,** whose promotion to superintendent of the Southern Kansas division of the Atchison, Topeka & Santa Fe, at Chanute, Kan., was reported in the May issue, was born at Niota, Ill., on December 30, 1891. He entered railway service with the Santa Fe in 1905 as a track laborer of the Illinois division. He subsequently served as timekeeper, assistant foreman, assistant extra gang foreman and section foreman until 1924 when he was promoted to roadmaster. In March, 1942, Mr. Jones was appointed trainmaster at LaJunta, Colo., and on January 5, 1945, he was advanced to acting superintendent with headquarters at Slaton, Tex.

## Engineering

**Glen H. Trout,** assistant chief engineer of the Union Pacific, with headquarters at Omaha, Neb., has retired.

**P. M. Hulce** has been appointed assistant division engineer of the Chicago division of the Chesapeake & Ohio, with headquarters at Peru, Ind.

**John Colin MacLauchlan,** roadmaster of the Gaspe lines of the Canadian National, has been appointed division engineer and bridge and building master, Island division, at Charlottetown, P. E. I., succeeding **Frederick S. Wilkins,** who has retired.

**Walter E. Quinn,** assistant division engineer of the Louisville & Nashville, with headquarters at Birmingham, Ala., has been advanced to assistant engineer in charge of the miscellaneous department at Louisville, Ky., to succeed **Howard C. Forman,** who has been assigned to other duties.

**D. M. Trotter,** assistant division engineer on the Canadian National at Hornepayne, Ont., has been promoted to division engineer, with the same headquarters, succeeding **A. V. Johnston,** whose transfer to Belleville, Ont., was reported in the May issue.

**G. G. Thomas,** engineer metal structures, of the Atlantic Coast Line, at Wilmington, N.C., has been appointed engineer of bridges, with the same headquarters. **B. E. Widder,** architect at Wilmington, has been named engineer of buildings there, and **A. C. Wessell** has been appointed assistant engineer of buildings, also at Wilmington.

**K. L. Miner,** former supervisor of bridges and buildings of the Mohawk division of the New York Central, at Albany, N. Y., who was recently honorably discharged as a captain in the Military Railway Service after duty overseas in Africa and Italy, has been appointed engineer of bridges, New York Central, Lines Buffalo and East, with headquarters at New York, succeeding **John L. Beckel,** who has returned to his former position of assistant engineer in the office of the engineer of structures, Lines Buffalo and East, at New York.

**Edward W. G. Chapman,** whose promotion to engineer maintenance of way of the Atlantic region of the Canadian National, at Moncton, N.B., was reported in the May issue, was born at Dartmouth, N. S., on September 17, 1890, received his B. S. degree from Nova Scotia Technical College in 1914, and entered railroading in July of that year

Edward W. G. Chapman

as a transitman in the engineering department of the Canadian Government Railways (now the Canadian National) at Truro, N. S. In January, 1916, he enlisted for overseas military service in the First World War, returning to Truro as transitman in June, 1919. He served as rodman from May, 1921, to June, 1923, when he became instrumentman at New Glasgow, where he remained until his appointment as division engineer at Edmundston, N. B., in November, 1927. Mr. Chapman was named assistant operating superintendent in December, 1941, and in May, 1943, he was advanced to superintendent of terminals at Sydney, the position held at the time of his recent appointment as engineer maintenance of way.

**Anthony J. Flanagan,** assistant engineer in the office of the engineer maintenance of way system of the New York Central, at New York, has been promoted to succeed **George Auer, Jr.,** whose appointment as division engineer of the Eastern division was reported in the May issue. Mr. Flanagan will have the same title and headquarters as formerly. **T. F. McCabe,** chief clerk to the engineer maintenance of way system, has been advanced to office assistant, succeeding to the duties of Mr. Flanagan.

**H. F. Whitmore,** division engineer of the Lake Erie and Western district of the New York, Chicago & St. Louis, at Frankfort, Ind., has been promoted to assistant to the chief engineer, with headquarters at Cleveland, Ohio. **M. B. Allen,** assistant division engineer, at Conneaut, Ohio, has been advanced to division engineer of the Clover Leaf district, with headquarters at Frankfort, succeeding **R. E. Oberdorf,** who has been transferred to

the Lake Erie and Western district, replacing Mr. Whitmore.

**Kenneth E. Stephenson,** assistant engineer on the Chesapeake & Ohio, at Huntington, W. Va., has been promoted to assistant cost engineer, with the same headquarters. **Thornton A. Archer** has been appointed assistant engineer succeeding Mr. Stephenson. Mr. Stephenson succeeds **Erle T. Rucker,** whose appointment as assistant division engineer, at Richmond, Va., was reported in the May issue.

**Robley H. Morrison, Jr.,** whose promotion to principal assistant engineer of the Bangor & Aroostook, at Houlton, Me., was reported in the April issue, was born at Rumford, Me., on February 15, 1912, and was graduated from the University of Maine in 1936. He worked as an engineer and inspector for the bridge division of the Maine State Highway Commission from 1936 to 1938, and was later engaged in construction work at Waterville, Me., until 1940. On February 1,

Robley H. Morrison, Jr.

1940, Mr. Morrison joined the Bangor & Aroostook as superintendent of bridges and buildings at Houlton, the position he held at the time of his advancement.

**Carl H. Vogt,** assistant division engineer of the Central division of the Central Railroad of New Jersey, has been promoted to division engineer of that division, including jurisdiction over the New York & Long Branch (owned jointly by the Jersey Central and Pennsylvania), with headquarters as before at Jersey City, N.J. Mr. Vogt succeeds **T. E. MacMannis,** whose promotion to engineer maintenance of way, was reported in the May issue. **E. J. Robrecht,** assistant engineer of the Central division, has been advanced to assistant division engineer, replacing Mr. Vogt.

**Barton Wheelwright,** whose promotion to chief engineer (operating) for the entire system of the Canadian National, at Montreal, Que., was reported in the May issue, was born at Minneapolis, Minn., on March 12, 1888, attended Massachusetts Institute of Technology, and received an A. B. degree from Harvard University in 1910 and an M. E. E. degree from Harvard in 1911. He entered railroading in June, 1911, as a draftsman with the Grand Trunk (part of the Canadian National) at Toronto, Ont., and transferred to the signal department in April, 1912. After serving as assistant signal engineer from December, 1914, to June, 1916, he was appointed acting signal engineer. In October, 1917, he became engineer maintenance of way of the Grand Trunk lines in New

Barton Wheelwright

England, and at the close of federal control he was named engineer-accountant to deal with matters pertaining to settlement between the corporation and the United States Railroad Administration. Mr. Wheelwright served as special engineer of the Canadian National from March, 1923, to January, 1928, when he became assistant to the chief engineer, and in July, 1936, he was appointed engineer maintenance of way of the Central region. Three years later he was promoted to chief engineer, Central region, the position he held at the time of his recent advancement.

**Howard A. Dixon,** whose retirement as chief engineer (operating) for the entire system of the Canadian National, at Montreal, Que., was reported in the May issue, was born at Sand Hill, Ont., on October 7, 1878, and received a B.A. degree from the

Howard A. Dixon

University of Toronto. After working as a land surveyor in Ontario and Manitoba, he joined the Canadian Northern (now the Canadian National) in March, 1903, at Winnipeg, Man., and shortly thereafter was appointed resident engineer. Mr. Dixon served as supervisor of various engineering activities at Maryfield, Sask., and Red Pass Junction, Resplendent, and Vancouver, B. C., until 1919, when he was appointed chief engineer of the Western region. He was promoted to chief engineer (operating) of the system, at Montreal, on January 1, 1940.

**E. J. Bayer,** assistant district engineer of the Cleveland, Cincinnati, Chicago & St. Louis (Big Four), at Cincinnati, Ohio, has been promoted to principal assistant engineer, with the same headquarters, succeeding **A. F. Maischaider,** who has retired after 43 years of service. **L. B. Elliott,** division engineer of the New York Central at Cleveland, Ohio, has been advanced to assistant district engineer of the Big Four, with headquarters at Cincinnati, relieving Mr. Bayer. **C. V. Talley,** supervisor of track at Galion, Ohio, has been promoted to division engineer of the Illinois division, with headquarters at Matoon, Ill., replacing **A. A. Keever,** who has been transferred to the New York Central at Cleveland, succeeding Mr. Elliott.

**Thomas Everett MacMannis,** whose appointment as engineer maintenance of way of the Jersey Central Lines, at Jersey City,

Thomas Everett MacMannis

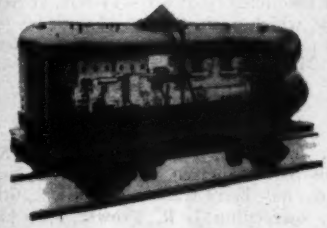
N.J., was announced in the May issue, was born on January 19, 1897, at Lonaconing, Md. After working as a rodman for the Cumberland & Pennsylvania for two years, he was graduated from Cornell University in 1922. In June of that year he joined the chief engineer's department of the Baltimore & Ohio and, on May 1, 1926, entered the service of the Jersey Central as assistant supervisor of track. In 1927 Mr. MacMannis was promoted to supervisor of track at Sommerville, N.J., remaining in that position until July 9, 1941, when he was advanced to division engineer at Jersey City.

**Guy H. Watson,** whose retirement from the position of engineer of track of the Boston & Maine, with headquarters at Boston, Mass., was reported in the April issue, was born on February 23, 1880, at Lyndonville, Vt., and is a graduate of Norwich university. He entered the service of the B. & M., in December, 1902, as a rodman. Later he served with the Pennsylvania and the Central Vermont as

*(Continued on page 604)*

# 6 Schramm Compressors *For* Better Track Maintenance

*Self-Propelled Rail Car*



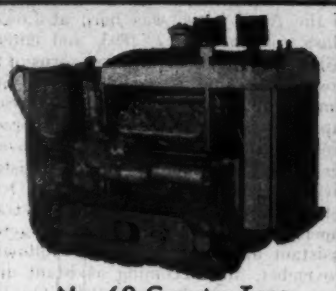
*Rail Car Mounted*



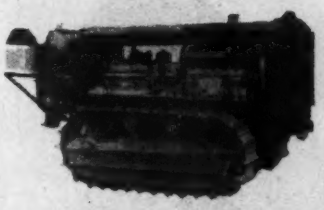
*Crawler Mounted*

**The right compressor for your track maintenance requirements can be found among the many SCHRAMM models, six of which are illustrated here. Two have flanged wheels; three are off-track crawlers, while the sixth is a hand-pushed trailer which may also be equipped with flanged wheels instead of the tires as shown.**

**Of varying capacity, all have the famous SCHRAMM liquid cooling, cam-operated intake, and high dependability. Select your next air compressor from this comprehensive SCHRAMM line; you will be better satisfied.**



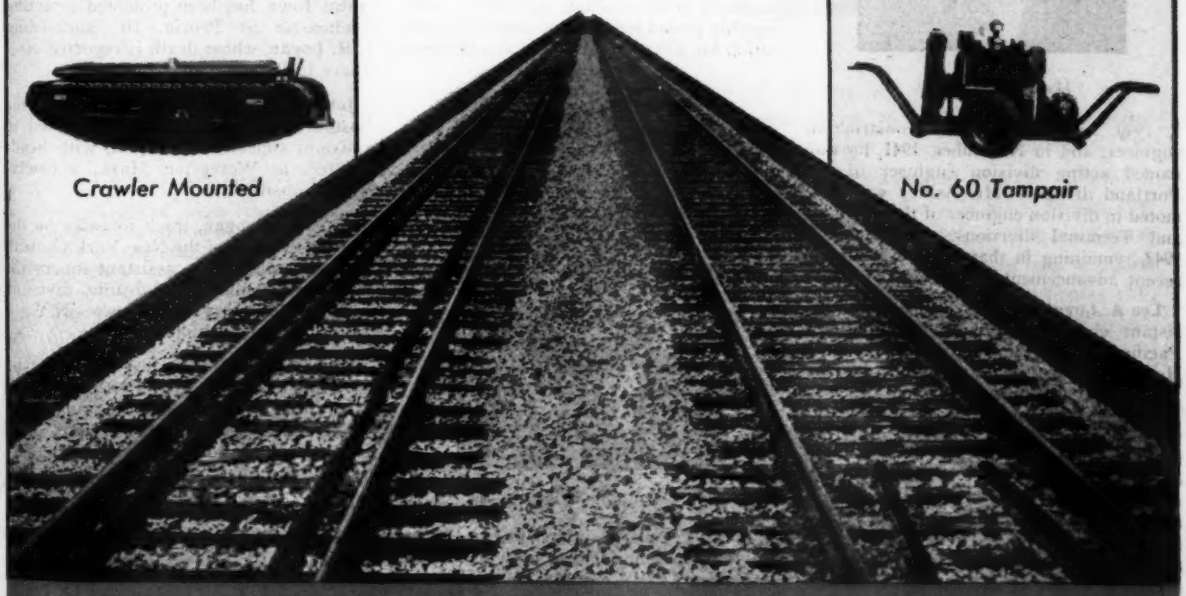
*No. 60 Crawler Type*



*Tractor Mounted*



*No. 60 Tampair*



**SCHRAMM, INC.** *THE COMPRESSOR PEOPLE* WEST CHESTER, PA.

assistant engineer of construction and resident engineer, respectively. He returned to the B. & M. in May, 1906, as assistant engineer and, in July, 1915, he was appointed division engineer of the White Mountains division. In 1925 he was transferred to the Portland division at Salem, Mass., and in April, 1927, he was promoted to assistant to the engineer maintenance of way. Mr. Watson was advanced to engineer of track, with headquarters at Boston, on July 1, 1938, which position he held until his retirement.

**Harold S. Ashley,** whose appointment as engineer of track of the Boston & Maine, at Boston, Mass., was announced in the April issue, was born at Lowell, Mass., on January 7, 1893, and entered railroading in the engineering corps of the Boston & Maine as a chainman in September, 1912. After serving in various capacities in the engineering corps he was promoted to assistant engineer on November 4, 1923, becoming acting assistant division engineer in May, 1928. In October, 1929, Mr. Ashley was appointed track supervisor, resuming his duties as acting assistant division engineer the following November, and becoming assistant division engineer in January, 1930. On July

Harold S. Ashley

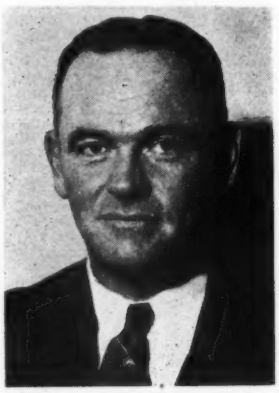
8, 1940, he was appointed construction engineer, and in November, 1941, he was named acting division engineer of the Portland division. Mr. Ashley was promoted to division engineer of the Portland and Terminal divisions on March 16, 1942, remaining in that position until his recent advancement to engineer of track.

**Lee A. Loggins,** whose promotion to assistant chief engineer of the Southern Pacific Lines in Texas and Louisiana, at Houston, Tex., was reported in the May issue, was born at Ennis, Tex., on June 28, 1902, and was graduated in railroad construction engineering from the University of Texas in 1937. He entered railroad service with the Southern Pacific Lines in Texas and Louisiana in 1920 as a coppersmith helper at Ennis, subsequently serving as utility clerk, rodman, chainman, instrumentman and engineer accountant at various points on the road until 1936 when he was granted a leave of absence to complete work for his degree at the University of Texas. In July, 1937, Mr. Loggins returned to the railroad as an instrumentman on the Victoria division, with headquarters at Victoria, Tex., and in August, 1939, he was promoted to assistant engineer, with the same headquarters. In June, 1942, he was appointed assistant engineer bridges and buildings, with headquarters at Houston, and in August, 1943, he was advanced

Lee A. Loggins

to division engineer of the Victoria division, at Victoria. Mr. Loggins was transferred to the Houston division in 1944, remaining in that location until his recent promotion.

**Harold J. McKenzie,** whose promotion to chief engineer of the Southern Pacific Lines in Texas and Louisiana, at Houston, Tex., was reported in the May issue, was born at Houston on October 11, 1904, and was graduated with a Bachelor of Science degree from Texas Agricultural and Mechanical College at College Station, Tex., in 1927. He entered railroad service in the drafting department of the Southern Pacific Lines in Texas and Louisiana, in 1926, and from July, 1927, until March, 1936, he was employed in various positions in the drafting department. During this period he also continued his education for a three-year period at a Houston



Harold J. McKenzie

engineering school, completing a structural engineering course. In 1936 Mr. McKenzie was appointed chief draftsman, continuing in that position until March, 1939, when he was named assistant to the chief engineer. In January, 1944, he was promoted to assistant chief engineer, the position he held at the time of his new appointment.

**George Auer, Jr.,** whose promotion to division engineer of the Eastern division of the New York Central, with headquarters at New York, was reported in the May issue, was born at Tuckahoe, N.Y., on October 10, 1896, and graduated in civil engineering from Columbia university. He entered railway service on March 16, 1918, as a chainman in the office of the chief engineer of the New York Central at New York, and on May 1, 1918, was advanced to rodman. On September 1, 1918, he entered military service, returning to his former position in the chief engineer's office of the New York Central on January 16, 1919. Mr. Auer later served as junior engineer and instrumentman in the same office, and on April 16, 1924, was advanced to clearance engineer in the maintenance of way department at New York. On December 1, 1925, he was appointed assistant supervisor of track at Rochester, N.Y., and on September 5, 1936, he was promoted to acting supervisor of track, with the same headquarters. Mr. Auer was appointed supervisor of track at Corning, N.Y. on November 1, 1937, and on July 1, 1940, he was advanced to assistant engineer of track, with headquarters at New York. On January 16, 1943, he was appointed assistant engineer in the office of the engineer maintenance of way—system, at New York, which position he held until his recent promotion to division engineer, effective May 1.

## Track

**E. L. Brand,** roadmaster on the St. Louis-San Francisco, at Yale (Memphis), Tenn., has been transferred to Chaffee, Mo., succeeding **J. R. Trower,** who has been transferred.

**M. E. Lau,** supervisor of track on the Chicago, Rock Island & Pacific, at Atlantic, Iowa, has been promoted to acting roadmaster at Peoria, Ill., succeeding **J. H. Logan,** whose death is reported elsewhere in these columns.

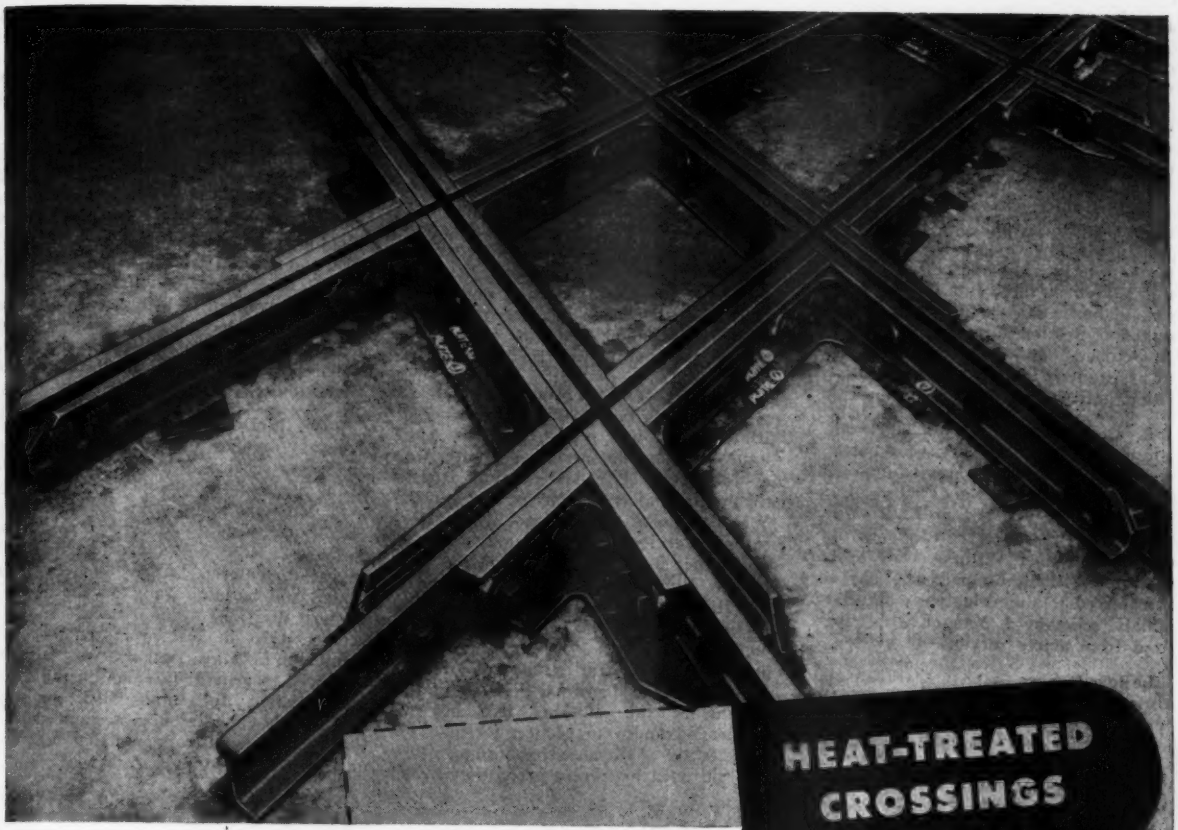
**John F. Regan,** a transitman on the Boston & Albany, has been promoted to assistant supervisor of track, with headquarters at Worcester, Mass., a newly-created position.

**Louis E. Grogan,** track foreman on the Harlem division of the New York Central, has been promoted to assistant supervisor of track on the Pennsylvania division, with headquarters at Geneva, N.Y., a newly-created position.

**Emil Gordon,** formerly roadmaster on the Canadian Pacific, at Perth, Ont., has been promoted to general supervisor maintenance of way of the Eastern lines of the Canadian Pacific, with headquarters at Toronto, Ont.

**M. M. Bodenmiller** and **S. L. Furry,** assistant supervisors of track on the Cleveland, Cincinnati, Chicago & St. Louis (Big Four) at Galion, Ohio, have been promoted to supervisors of track, with the same headquarters, succeeding **C. V. Talley,** whose promotion to division engineer of the Illinois division, at Mattoon, Ill., is noted elsewhere in these

*(Continued on page 606)*



# WEIR KILBY

**HEAT-TREATED CROSSINGS WIN WIDE APPROVAL of Railroads**

**CATALOG "H"**

**Comprises 154 pages of helpful data, replete with photos, drawings and specifications, covers every track work need. A request on your letterhead will bring your copy promptly.**

Every effort has been made to improve the methods involved in the manufacture of heat-treated constructions, to meet the need for better railroad crossings to serve the increasingly severe traffic demands. The Weir Kilby heat-treated crossing is the culmination of these efforts. It will stand up under the most severe conditions. It is lower in first cost than many crossings of other heavy duty constructions and in most cases will prove more economical to maintain. After exhaustive trial in actual service these crossings have been found so satisfactory that some railroads are now using them to the virtual exclusion of all other types.

*Standard and Special Track Work for Steam Railroads Since 1882*

## WEIR KILBY CORPORATION

CINCINNATI 12, OHIO — BIRMINGHAM 7, ALA.

*Successors to*

WEIR FROG CO. . . . KILBY FROG & SWITCH CO. . . . CINCINNATI FROG & SWITCH CO.

columns, and **C. C. Wehrle,** who has been transferred to Cleveland, Ohio, replacing **J. Carey.** Mr. Carey has been transferred to Ashtabula, Ohio, in place of **H. E. Wall,** who has been transferred to Cleveland, relieving **T. Ryan,** who has retired.

**W. R. Hunter,** whose promotion to roadmaster on the Union Pacific, at Cache Junction, Utah, was reported in the April issue, entered railway service as a section laborer on the Union Pacific, at Weston, Idaho, in March, 1923. He was promoted to section foreman in May, 1924. In October, 1941, he was further advanced to assistant roadmaster, holding this position until his recent promotion.

**R. D. McKinnon,** section foreman at Brandon, Man., has been promoted to roadmaster of the Kaministiquia subdivision of the Canadian Pacific, at Fort William, Ont., succeeding **L. R. Weare,** who has been transferred to the Terminal division at Fort William. Mr. Weare replaces **William Cooper,** who has been transferred to the Winnipeg (Man.) terminals, relieving **I. Vangel,** who has retired from active service.

**LeRoy J. Shea,** assistant track supervisor on the Central Railroad of New Jersey, at Ashley, Pa., has been promoted to track supervisor on the Lehigh and Susquehanna division, with the same headquarters, and with jurisdiction over the territory between Whitehaven, Pa., and Scranton. Mr. Shea succeeds to a portion of the duties of **J. W. Rementer,** who continues as track supervisor at Mauch Chunk, Pa., and with supervision of the territory between Whitehaven and Easton, Pa.

**William R. Dunn, Jr.,** whose promotion to supervisor of track on the Pennsylvania at Reading, Pa., was reported in the April issue, was born at Philadelphia, Pa., on December 11, 1918, and attended Lafayette college. He entered railway service in September, 1940, as a rodman on the Eastern division of the Pennsylvania, at Pittsburgh, Pa., later serving as an assistant on the engineer corps at Cleveland, Ohio, and Aspinwall, Pa. In 1942, Mr. Dunn was appointed assistant supervisor of track at Niles, Ohio, and in 1943 he was transferred to East Liberty, Pa., where he remained until his recent promotion.

**W. M. S. Dunn,** whose appointment as general inspector of tracks of the New York, Chicago & St. Louis, at Cleveland, Ohio, was reported in the May issue, was born at Covington, Ky., on June 22, 1906, and received his higher education at Virginia Military Institute. He entered railway service with the C. & O. on January 1, 1925, as a chainman on the engineering corps, serving in this capacity and as a rodman until 1929, when he was made a draftsman in the office of the engineer maintenance of way, at Richmond, Va. In 1937, Mr. Dunn was promoted to assistant cost engineer of the Logan division, and in February, 1944, he was further advanced to supervisor of track at St. Albans, holding this position until his recent appointment.

**Leonard Stott,** whose promotion to roadmaster on the Canadian National at Palmerston, Ont., was reported in the April issue, was born at Sarnia, Ont., on December 4, 1907, and was educated in the public schools of Sarnia. He entered railway service in June, 1927, as a sectionman on the Canadian National at Sarnia, and in March, 1931, he was promoted to assistant section foreman. In November, 1936, Mr. Stott was further advanced to section foreman at Hagersville, Ont., serving subsequently at Kerwood, Ont., Wyoming, and Sarnia, until May, 1943, when he was made assistant roadmaster at London, Ont., the position he held at the time of his recent promotion.

**C. A. Hagen,** whose promotion to supervisor of track on the Illinois Central, at Bluford, Ill., was reported in the April issue, was born in Gasconade county, Mo., on January 22, 1908, and was educated in the public schools of Searcy, Ark., and the Y.M.C.A. College in Chicago. He entered railway service as an assistant foreman timekeeper for section gangs on the Chicago & Illinois Western, a subsidiary of the Illinois Central, in November, 1928. In February, 1932, he became a track laborer, and in June, 1936, Mr. Hagen was promoted to assistant extra gang foreman on the Chicago Terminal division of the Illinois Central. In May, 1938, he was further advanced to section foreman on the C.&I.W. at Chicago, remaining in this position until his recent promotion.

**M. F. Ward,** whose promotion to supervisor of track on the Illinois Central, at Paducah, Ky., was reported in the April issue, was born in Marshall county, Ky., in June, 1913, and was educated in the public schools of that county. He entered railway service in November, 1922, as a section laborer on the Illinois Central at Paducah, and in November, 1923, he was promoted to section foreman at that point. Mr. Ward served as extra gang foreman on the Kentucky division from August, 1938, until August, 1941, when he was appointed section foreman at Mayfield, Ky. In August, 1943, he was advanced to general track foreman on the Kentucky division, with headquarters at Paducah, and in October of that year he was further advanced to acting supervisor of track of the Evansville district, at Princeton, Ky. Mr. Ward was subsequently transferred to Tutwiler, Miss., and to Paducah, remaining in the latter position until his recent promotion.

## Bridge & Building

**D. H. Dowe,** bridge designer on the Seaboard Air Line, has been appointed general steel bridge inspector, with headquarters at Norfolk, Va.

**William F. Meyers,** whose retirement as superintendent of bridges and buildings of the Iowa division of the Chicago & North Western, at Boone, Ia., was reported in the May issue, was born at Lanark, Ill., on January 29, 1876, and was educated in the public schools of Ames, Ia. He entered railway service as a bridge and building carpenter with the North Western, in December, 1896, and in 1904, he was promoted to foreman. In 1909, Mr. Meyers was promoted to supervisor of bridges and buildings on the Iowa and Minnesota division, at Belle Plaine, Ia., and in December, 1913, he was further advanced to superintendent of bridges and buildings at Boone.

**John Calvin Davis,** whose promotion to supervisor of bridges and buildings of the Richmond, Fredericksburg & Potomac, was reported in the April issue, was born in King William County, Va., on May 6, 1878, and entered railway service on April 6, 1900, as a carpenter on the R. F. & P. He was advanced to bridge and building foreman on December 1, 1917, and to general foreman on November 15, 1943, which position he held until his recent promotion.

**J. W. McDonald,** whose promotion to general foreman bridges and buildings and water service, of the Eastern division of the St. Louis-San Francisco, at Springfield, Mo., was reported in the May issue, was born near Ash Grove, Mo., on January 25, 1893, and, after a high school education, entered railway service in a bridge and building gang on the Southwestern division of the Frisco. In November, 1916, he was promoted to foreman, and in May, 1930, he was further advanced to general foreman on the Central division. In January, 1932, he was again made gang foreman account reduction in forces, remaining in that position until his recent promotion April 1.

**G. W. Carbaugh,** assistant supervisor of bridges and buildings on the Shenandoah division of the Norfolk & Western, has been promoted to supervisor of bridges and buildings on the Radford division at Roanoke, Va., succeeding **H. B. McColgan.** Mr. McColgan has been transferred to the Scioto division, with headquarters at Portsmouth, Ohio, relieving **J. P. Mills,** who retired from active service on May 1. **E. S. Chaffin,** bridge inspector in the engineering department, has been advanced to assistant supervisor of bridges and buildings on the Shenandoah division, replacing Mr. Carbaugh.

**Joseph W. Snyder,** whose promotion to inspector and supervisor of bridges and buildings of the New York, Ontario & Western, with headquarters at Middletown, N. Y., was reported in the April issue, was born in Westbrookville, N. Y., on September 14, 1882. He entered railway service as a bridge carpenter on the Delaware, Lackawanna & Western on May 13, 1903, and later served that road as a bridge carpenter foreman and an erecting foreman. In February, 1911, he went with the N. Y. O. & W., and three months later went with the American Bridge Company as an assistant foreman. Mr. Snyder returned to the N. Y. O. & W. in 1912, serving as a bridge and building foreman and an inspector of bridges and buildings until his recent promotion.

**Foster R. Spofford,** whose promotion to assistant division engineer of the Portland division of the Boston & Maine, at Dover, N.H., was reported in the April issue, was born on March 26, 1906, at Phillipsburg, N. J., and attended the engineering school at Tufts college, being graduated in civil and structural engineering in 1927. From July, 1928, to

*(Continued on page 608)*

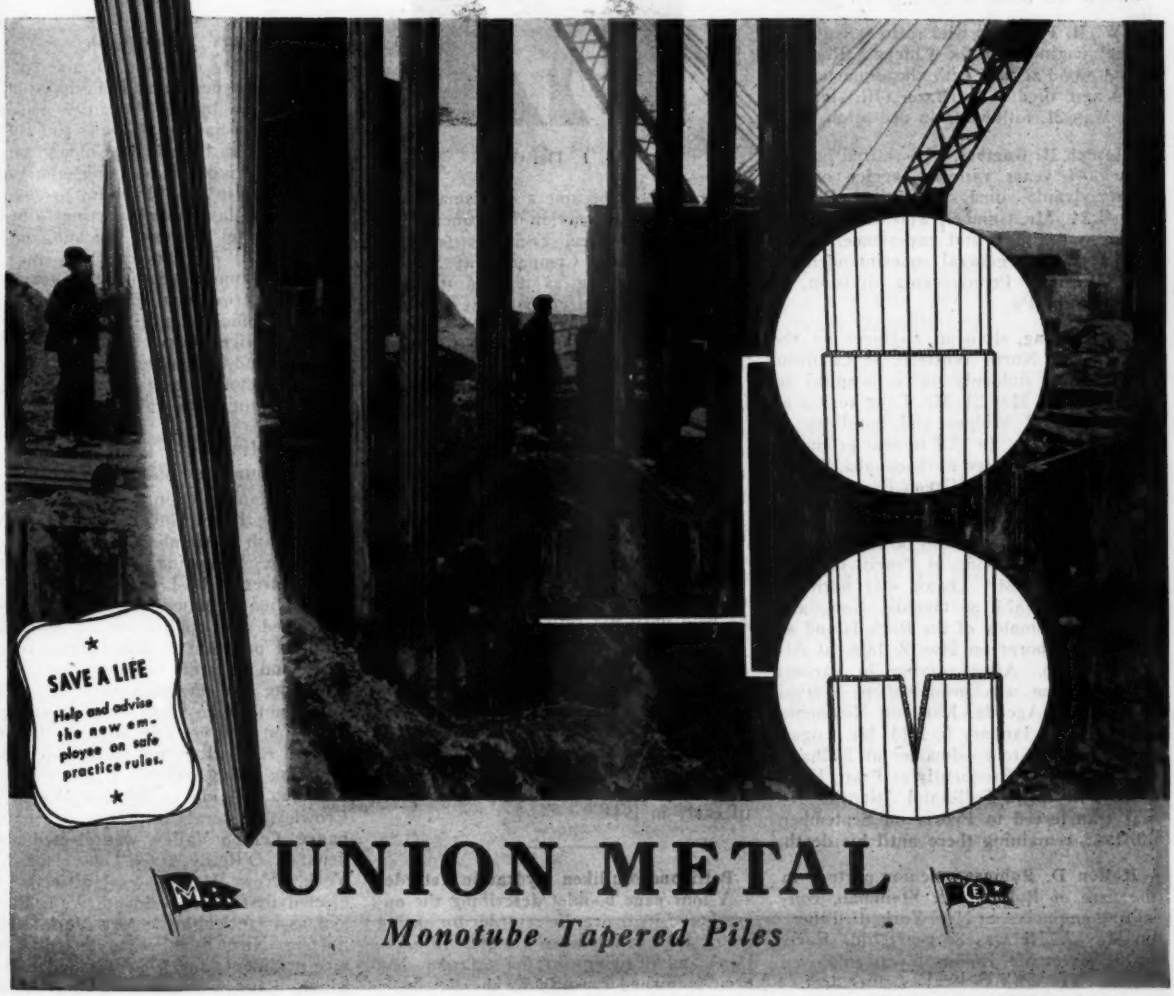
# *Better design* makes

# MONOTUBES First in Foundations

PICTURED here are Monotube extendible piles. Experienced engineers and contractors know them well—because they've used them on bridge, building, and marine construction projects, large and small, all over the country.

Designed to do their job better, faster, and at lower cost, Monotubes have four outstanding features. (1) Their light weight makes them easy and economical to handle; (2) their tapered, fluted construction permits fast driving with average job equipment; (3) they are simple to extend in the field—even in low headroom; and (4) their tubular shape facilitates quick, positive inspection.

Available in gauge, size, and taper to meet varied requirements. Catalog and complete details free on request. Write The Union Metal Manufacturing Company, Canton 5, Ohio.




## UNION METAL

*Monotube Tapered Piles*

March, 1929, he served as an inspector on sewer construction with the consulting engineering firm of Metcalf & Eddy, then going with the firm of Jackson & Moreland to serve as a designing draftsman on the electrification of the Delaware, Lackawanna & Western. He entered the service of the Boston & Maine on October 15, 1929, as a structural draftsman at Boston. On December 1, 1937, he was promoted to assistant supervisor of bridges and buildings, and in January, 1940, he was advanced to supervisor of bridges and buildings at Boston the position he held at the time of his recent promotion.

## Obituary

**Thomas D. Kemp,** who retired in 1932 as bridge inspector of the Eastern lines of the Southern, with headquarters at Charlotte, N.C., died on April 28, at Charlotte.

**Arthur Crumpton,** who retired in 1925 as valuation engineer of the Grand Trunk and Canadian National lines in the United States, died recently at Weston, Ont.

**Gilbert J. Bell,** who retired in July, 1936, as district engineer of the eastern district of the Atchison, Topeka & Santa Fe, with headquarters at Topeka, Kan., died at his home in Chicago on April 29.

**W. H. Petersen,** who retired in 1937 as chief engineer of the Chicago, Rock Island & Pacific, with headquarters at Chicago, died in a Dixon (Ill.) hospital on May 21, following an operation.

**Joseph H. Gumbes,** who retired in 1929, after 44 years railway service on the Pennsylvania, died at Merion, Pa., on April 24. Mr. Gumbes, who was an engineer by training and experience, served for a time as general superintendent of the Western Pennsylvania division, at Pittsburgh, Pa.

**S. S. Long,** division engineer on the Chicago & North Western, at Chadron, Neb., died suddenly in a hospital at Chadron, on May 21. Mr. Long served as supervisor of bridges and buildings at Mason City, Ia. In 1937 he was promoted to division engineer at Escanaba, Mich., being transferred to Green Bay, Wis., in 1941, and to Chadron in 1944.

**J. H. Logan,** roadmaster on the Chicago, Rock Island & Pacific, at Peoria, Ill., died on April 17. Mr. Logan was born on October 17, 1873, at Oneida, Kan., and entered the employ of the Rock Island as a section laborer on May 8, 1898, at Albright, Neb. After serving in various capacities he was promoted to section foreman at Agenda, Kan., on November 29, 1904. On January 6, 1913, Mr. Logan was advanced to roadmaster at Dalhart, Tex., serving subsequently at Pratt, Kan., Sibley, Ia., Iowa Falls and Atlantic. He was transferred to Peoria on September 10, 1942, remaining there until his death.

**Holton D. Robinson,** senior partner in the firm of Robinson & Steinman, consulting engineers, at New York, died there on May 7. He was 82 years old. Early in his career Mr. Robinson was employed by the New York Central as chief draftsman, and in 1913 he was named consulting bridge engineer of the Canadian Northern (now the Canadian National), Eastern lines.

**George T. Hand,** consulting engineer of the Lehigh Valley, who retired as chief engineer of that road in June, 1937, died on May 13 in the Orange (N.J.) Memorial hospital after a brief illness.

**O. F. Dalstrom,** who retired in 1941 as engineer of bridges of the Chicago & North Western, with headquarters at Chicago, died at Princeton, Ill., on April 13. Mr. Dalstrom was born at Wyanet, Ill., on August 15, 1871, and attended Fremont (Neb.) Normal College and Rensselear Polytechnic Institute, graduating in civil engineering from the latter in 1901. In

O. F. Dalstrom

June, 1901, he became a draftsman in the bridge and construction department of the Pennsylvania Steel Company (now the Bethlehem Steel Company) at Steelton, Pa., later serving as a shop inspector. He then served successively as a detailer on movable bridges for the Scherzer Rolling Lift Bridge Company; detailer on steel structures for the Riverside Bridge Company, at Martin's Ferry, Ohio, and detailer and checker on steel bridge plans for the Pennsylvania Steel Company. He entered railway service on June 1, 1906, as a detailer, checker and designer on plans for bridges and other structures for the North Western, and four years later he was promoted to chief draftsman in the office of the engineer of bridges. On March 1, 1917, Mr. Dalstrom was promoted to engineer of bridges, the position he held until his retirement.

After leaving the North Western, Mr. Dalstrom, in 1942, went with the War Production Board as senior industrial specialist of the Division of Civilian Supply, and in June, 1943, he was elevated to assistant chief, way and structures, of the Transportation Equipment Division, which position he continued to hold until early in 1944.

---

**Pettibone Mulliken Hydraulic Retarder**—A four-page booklet describing the operation of its hydraulic retarder for spring frogs, and which also contains illustrations and drawings of the retarder, has been published recently by the Pettibone Mulliken Corporation, Chicago.

# Association News

## Bridge and Building Association

The work of the eight technical committees of the association is progressing favorably, looking to the presentation of reports from these committees at the one-day annual (restricted) meeting, to be held at the Hotel Stevens, Chicago, on October 17. The preliminary drafts of all committee reports will be reviewed by the Executive committee at a meeting to be held in Chicago on July 16.

## Maintenance of Way Club of Chicago

Having completed one of the most successful years of the club with its annual meeting in Chicago on April 23, President-elect C. C. Pelley is planning an early meeting of the Executive committee, looking to the appointment of new standing committees and the laying of tentative plans for the year ahead. The next regular meeting of the club, starting its new fall season, will be on October 22, at Chicago.

## Roadmasters' Association

Preliminary drafts of the five technical committee reports now in preparation will be reviewed by the Executive committee of the association at a meeting of this committee to be held in Chicago on July 10. Following this meeting, the reports will be put in final shape for presentation at the one-day annual meeting to be held in the Hotel Stevens, Chicago, on September 12. As announced in the May issue, the annual meeting this year will be definitely restricted in character, open alone to officers and directors, the chairmen and vice-chairmen of technical committees, and those other members who can attend without interfering with their work and without train travel.

## Metropolitan Maintenance of Way Club

The annual meeting was held on April 26 at the Hotel Governor Clinton, New York, with 92 members and guests in attendance. Following dinner, the meeting was addressed by I. H. Schram, chief engineer maintenance of way, Erie, who described the application of his road's training program to maintenance of way work and to safety training.

During the business meeting it was voted not to have an annual outing in June, but to have one later in the year, if OPA regulations and the transportation situation will permit.

In the election of officers, Walter W. Crowley, general inspector of maintenance, Lehigh Valley, was elected president; P. O'Reilly, track supervisor, New York, New Haven & Hartford, was elected first vice-president; A. J. Flanagen, assistant engineer, New York Central System, New York, was elected second vice-president; and J. S. Vreeland, eastern editor, *Railway Engineering and Maintenance*

*(Continued on page 610)*

# FLEXIBLE ARMOR

## for STEEL and CONCRETE...

To assure *complete* protection a coating must become an integral part of the surface it covers... expanding, contracting, moving with the structure itself.

Bridges, piers, tanks, smoke chambers, abutments and piling ...they all need the flexible armor protection that Flintkote offers.

This asphaltic-base coating resists cinder abrasion, corrosive locomotive blast, acid-forming seepage and weather. It *seals out* corrosion, and puts a tough, resilient surface between the structures and flying cinders. The base materials *cannot* erode when protected by Flintkote.

This elastic armor is easy and quick to apply... and one "plating" lasts for years. It will not sag or flow under heat or crack from cold. The cost is truly economical.

Behind Flintkote Products are more than 40 years of experience . . . painstaking development work to assure that each product bearing the Flintkote name is more than adequate for the job it was designed to do. Write for complete information.

FLINTKOTE INDUSTRIAL PRODUCTS

## THE FLINTKOTE COMPANY

**30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.**

***Industrial Products Division***

Atlanta • Boston • Chicago Heights • Detroit • Los Angeles • New Orleans
Washington • Montreal • Toronto

*nance,* was re-elected secretary-treasurer.

Members elected to the Executive committee, in addition to Mr. Crowley, included H. J. Weccheider, division engineer, Erie; T. Lederman, roadmaster, Delaware, Lackawanna & Western; J. P. Zearley, supervisor of track, Pennsylvania; and G. L. Mayer, district manager, Duff-Norton Manufacturing Company.

### Railway Tie Association

Unable to hold its regular annual convention, the Railway Tie Association, at a meeting of its Executive committee at the Hotel Statler, St. Louis, Mo., on May 8, completed one of its most constructive years of work. Against a background of critical tie production shortages and dwindling inventories, the Executive committee, after a closed session, opened its proceedings to interested members for the presentation of two addresses, nine committee reports and the election of officers.

The morning and afternoon sessions were presided over by R. M. Hamilton, president (D. B. Frampton & Co., Pittsburgh, Pa.), assisted by E. J. McGehee, first vice-president, (Wood Preserving Division, Koppers Company, Pittsburgh, Pa.), and Roy M. Edmonds, secretary and treasurer.

Among the various reports presented were those on the following subjects: Problems Affecting Tie Production from Small Portable Sawmills; Investigate Checking and Splitting of Ties from the Standpoint of the Tie Producer; the Checking and Splitting of Crossties in Track; Manufacturing Practice; Operation of Concentration Yards; and Timber Conservation.

In the election of officers, Mr. McGehee was chosen as president; Waldo Tiller (J. A. Tiller & Sons, Little Rock, Ark.) was elected first vice-president; Ricker Van Metre (Wyoming Tie & Timber Co., Chicago) was chosen second vice-president; and the following were elected directors—T. J. Turley, Jr. (Bond Brothers, Louisville, Ky.); E. W. Jones (T. J. Moss Tie Company, St. Louis, Mo.); J. F. Renfro (Taylor-Colquitt Company, Spartanburg, S.C.); and J. H. Tabb (J. H. Tabb & Company, Houston, Miss.).

### American Railway Engineering Association

Four committees are planning to hold meetings during June, including the Committee on Highways, which will meet at Chicago on June 7; the Committee on Economics of Railway Location and Operation, which will meet at Cleveland, Ohio, on June 13; the Committee on Wood Bridges and Trestles, which will meet at Chicago on June 19; the Committee on Masonry, which will meet at Chicago on June 20 and 21, and the Committee on Roadway and Ballast which will meet at Chicago on June 12 and 13.

Four committees held meetings during May, including the Committee on Records and Accounts, which met at Washington, D.C. on May 9 and 10; the Committee on Iron and Steel Structures, which met at Chicago on May 8 and 9; the Committee on Maintenance of Way Work Equipment, which met at Chicago on May 15 and 16; and the Committee on Impact, which met at Chicago on May 10.

In the letter ballot on recommended revisions in Manual material, which was completed on May 1, all recommendations were approved. In addition, all the recommendations have been acted on favorably by the General committee of the Engineering Division, Association of American Railroads, and are now in the hands of C. H. Buford, vice-president, Operations and Maintenance department, A.A.R.

Because the number of available copies of the Manual has been depleted more rapidly than anticipated, the decision has been made to reprint the Manual this year instead of in 1946, as originally contemplated. To this end, the committees have been requested to review their chapters and notify the secretary promptly of any necessary adjustments and corrections that can be made without the approval of the membership. While the text will thus be brought up to date with respect to such matters as A.S.T.M. references, and cross references between individual parts of the Manual, there will still remain many items to be reconciled but which, because they demand association approval, will have to be carried over for action in 1946.

## Supply Trade News

### Personal

The name of the **Westinghouse Electric and Manufacturing Corporation,** Pittsburgh, Pa., has been changed to the **Westinghouse Electric Corporation.**

**The Union Metal Manufacturing Company,** Canton, Ohio, has been presented with its third Army-Navy "E" award for "high achievement in the production of war materials."

**The Buda Company,** Harvey, Ill., has announced the opening of four new sales and service offices as a means of increasing facilities for the users of Buda products. The new branches are located at Portland, Me., Cincinnati, Ohio, Columbia, S.C., and Regina, Sask.

**A. Milne & Company** has been appointed national distributor for wrought iron bars manufactured by **A. M. Byers Company,** Pittsburgh, Pa. The Milne Company operates warehouses in New York, Boston, Mass., Chicago, Pittsburgh and Philadelphia, Pa., and maintains an office in Washington, D.C.

### General

**Ivan E. L. Eide** has been appointed district manager in the Pacific Northwest in charge of Oliver "Cletrac" industrial sales of the Oliver Corporation, Cleveland.

**Tracy V. Buckwalter,** vice-president and chief engineer of the **Timken Roller Bearing Company,** Canton, Ohio, has retired, but will continue in a consulting capacity. **Albert L. Bergstrom,** executive engineer, has been elected vice-president in charge of engineering and **O. J. Horger,** formerly in charge of railway engineering and research, has been appointed chief engineer. **C. L. Eastburg** has been named assistant chief engineer of the railway division.

**David Greene,** assistant vice-president of the **Magor Car Corporation,** New York, has been elected vice-president. **W. P. Smith,** has been elected vice-president of the **Magor Car Export Corporation.**

**William F. Ball,** who served the Army Service Forces as senior procurement specialist for the Hardware Procurement division, at the Jeffersonville, Ind., quartermaster depot during 1942 and 1943, has been appointed field service manager of the **Wood Shovel and Tool Company,** Piqua, Ohio, with headquarters at Piqua.

**John E. Mahoney,** assistant general sales manager of the **P. & M. Co.,** Chicago, has been promoted to general sales manager, with headquarters at Chicago. Mr. Mahoney was born on November 23, 1893, and in June, 1910, he entered railway service in the maintenance of way department of the Illinois Central. Two years later he went with the P. & M. Co. as a material inspector, and in 1914 he was assigned to the sales department. In 1937 Mr. Mahoney was promoted to Chicago district sales agent, and in 1943 he was advanced to the position he held at the time of his new appointment.

**J. L. Mullin,** general superintendent of foundries of the **American Manganese Steel** division of the **American Brake Shoe Company** has been promoted to vice-president in charge of operations, with headquarters as before at Chicago Heights, Ill. Mr. Mullin became associated with the manganese steel industry in 1914, when he entered the employ of the Edgar Allen Manganese Steel Company, now a part of the American Brake Shoe Company, as a clerk in the annealing department. Since that time he has served as local purchasing agent, foundry superintendent, works manager at New Castle, Del., and general superintendent of foundries.

**J. C. Schaefer,** a field engineer in the Pittsburgh, Pa., district office of the **Allis-Chalmers Manufacturing Company,** Milwaukee, Wis., has been promoted to manager of the Youngstown, Ohio, branch office, succeeding **E. H. Legler,** who has been transferred to the electrical department, at Milwaukee. **L. E. Stacey,** a field engineer in the Pittsburgh district office, has been appointed resident field engineer at Wheeling, W. Va. **Charles F. Codrington** has been appointed assistant to the manager and **A. E. Caudle** has been appointed sales manager of the company's blower and compressor department. **Ernest Franks** has been named sales manager of industrial wheel tractors in addition to his previous duties as the head of sales of the power unit department.

---

**Federal Precast Concrete Roofs**—The Federal Cement Tile Co., Chicago, has published a four-page booklet containing a brief description of Federal precast concrete roofs, together with several illustrations and drawings of this type of roof.

# WOODINGS-VERONA TOOL WORKS

VERONA, PA.

*Since 1873*

# WHY?

## SEND A BOY OUT TO DO A MAN'S WORK

WE BELIEVE WE CAN PROVE TO YOU

IF YOU ARE NOT USING

## VERONA FIXED TENSION TRIFLEX SPRINGS

ON YOUR TRACK BOLTS YOU ARE

SENDING A BOY OUT TO DO A MAN'S WORK.

MAY WE HAVE THE OPPORTUNITY OF

PRESENTING OUR PROOF?

## WOODINGS FORGE *and* TOOL COMPANY

VERONA, PA. CHICAGO, ILL.

*Offices Principal Cities*

# JORDAN

## Spreader-Ditcher

Roadbed Stabilization—grading and resloping the right of way—restores and strengthens track embankments, increases drainage and reduces man-hours and cost of general track maintenance.

Roadbed Stabilization requires heavy earth-moving operations that can be performed faster and with less effort by using a JORDAN Composite Spreader-Ditcher.

Does the work of an Army of Men— and does it better!

**O. F. JORDAN COMPANY** EAST CHICAGO INDIANA

Walter J. Riley, *President*

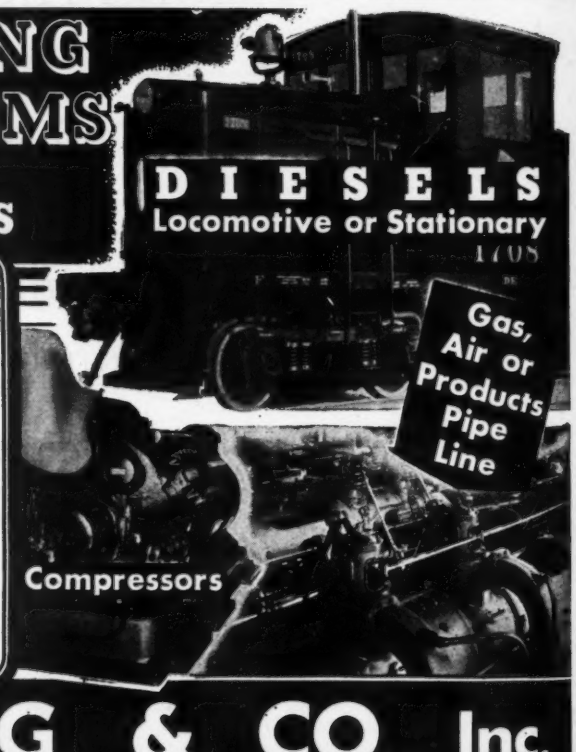
# JACKET COOLING WATER PROBLEMS

respond to

**HAERING GLUCOSATES**

Write for "H-O-H Light-house," containing articles on Diesel Engine Cooling Water Treatment and Scale and Corrosion Control in Engine Jacket Cooling Systems.

WE READ WATER




**D. W. HAERING & CO., Inc.**

GENERAL OFFICES:

205 West Wacker Drive, Chicago 6, Illinois

# Keep Floors Level – Speed Traffic with

# Quick-Floor

**Repair or Resurface... Inside or Outside... STATION PLATFORMS COACH YARDS • FREIGHT YARDS • BAGGAGE ROOMS ... DRIVEWAYS**

QUICK-FLOOR is ready-mixed—is easily laid (a square foot a minute)—sets by pressure—requires no drying time—can be used as soon as laid—outwears the original concrete. Unconditionally guaranteed. Write or phone today for help on your specific problems.

**Quick-Floor**

Made By DURA-TRED COMPANY

335 N. Central Park Blvd. • Chicago 24, Ill. • Van Buren 2171

## A MESSAGE OF IMPORTANCE TO ALL RAILROAD MAINTENANCE SUPERVISORS AND PURCHASING AGENTS

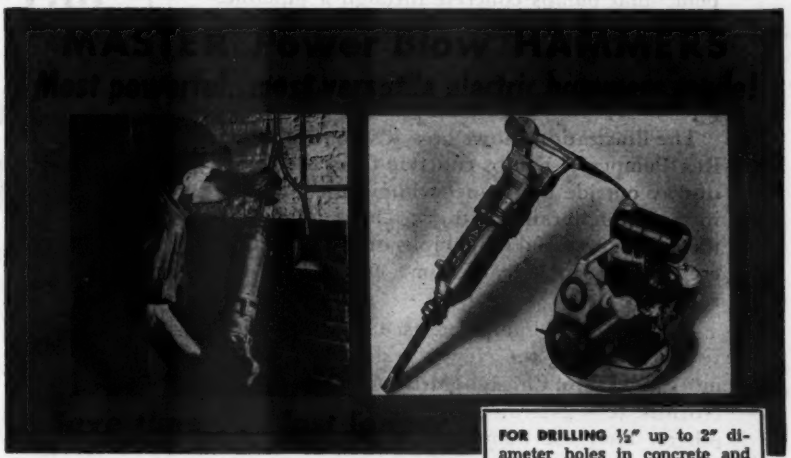
**FOR PORTABLE POWER WHEN AND WHERE YOU NEED IT . . .**

for all power or lighting requirements from ½ KVA to 17 KVA . . . AC or DC . . .

**USE MASTER GAS-ELECTRIC GENERATOR PLANTS . . .**

**Save time . . . save money . . . speed work!**

Master Vibrator Company provides compact, portable gas-electric generator plants in eleven basic sizes from 500 watts to 17,660 watts and thirty different types to meet all AC or DC power or lighting requirements. Housed or open models . . . available with wheelbarrow, buggy or trailer mounting. For operating a single tool or motor or floodlight . . . or operating gangs of tools, groups of motors or lighting entire areas. Easy to put into operation . . . economical to operate and maintain. It will pay you to get complete illustrated details and specifications . . . **write Department of Information, Master Vibrator Company, Dayton 1, Ohio, and ask for Bulletin 594.**



**Available with tools for drilling, cutting or spading. Will do light duty work or any heavy duty work. The Master Hammer runs without striking a blow until pressure is applied, enabling operator to control blow as job requires. Easy and economical to operate. Built for light weight and long service. Used throughout the world. Power blow hammers operate on 115 volt AC or DC, 25, 50, or 60 cycle. If no electricity is available use Master Portable Generator Plant Model 650 (illustrated above).**

**Write for Bulletin 500 for complete details.**

**FOR DRILLING** ½" up to 2" diameter holes in concrete and other hard materials.

**FOR CUTTING** concrete and other materials. For vibrating, tamping, chipping steel, cast iron and wood...scaling and caulking...peening welds and other heavy work.

**FOR SPADING,** cutting clay and similar materials.

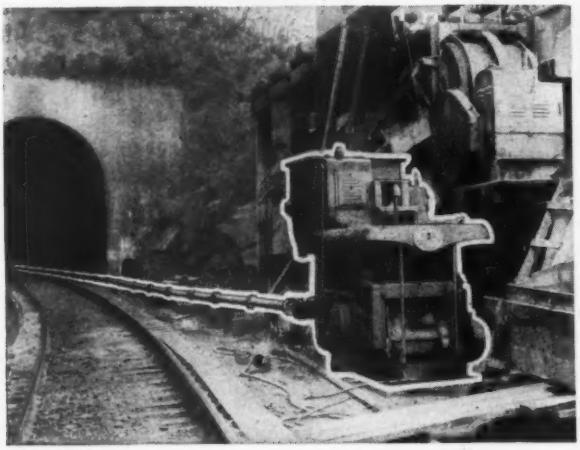
**MASTER VIBRATOR COMPANY** DAYTON 1, OHIO

Distributors throughout United States, Canada and other countries

*Products Include:* Portable Gas-Electric Generator Plants, 500 watts to 17,000 watts, Voltage Regulators and Portable Mountings Optional • Master Flood and Shovel Lights • Concrete Vibrators (Gas or Electric) High Speed Tools and Concrete Surfacing Attachments • Big 3—Generators and Tool Equipment • Concrete Vibratory Finishing Screeds • Concrete Troweling Machines (Gas or Electric) • Electric Hammer and Spade, Hammer Tools • Pavement Breaker and Tie Tamper • Back-Fill Tamper and Tie Tamper • Grinding Machines and Tools • Electric Hoist (Export Only)

# PUZZLE:

## HOW TO LINE A TUNNEL WITHOUT DISRUPTING TRAFFIC



Tough assignment? Not at all. The solution is simple. You do it with Rex Pumpcrete . . . the pump that pumps concrete through a pipeline. It's the modern, efficient and practical method that takes concrete placement out of the "lift and carry" class and makes it a simple pump and pipeline operation.

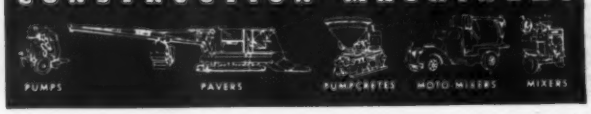
The illustration shows how it's done . . . how Rex Pumpcrete pumps concrete from the right-of-way outside the tunnel without the slightest interruption to railroad traffic. This is but one of the many successful tunnel jobs on which Pumpcrete is saving valuable time and money for railroads.

You'll find Rex Pumpcrete used by many major roads, including the New York Central; Baltimore and Ohio; Chicago, Milwaukee & St. Paul; Norfolk & Western; Denver & Salt Lake and others. They use Pumpcrete because it's faster and more economical . . . because the concrete can be transported, elevated and placed in a single operation, safely, without traffic interruption . . . by pumping through pipeline.

**For complete information on Pumpcrete, send for copy of new Bulletin No. 466. Chain Belt Company, 1601 W. Bruce St., Milwaukee 4, Wis.**

REX **CHAIN BELT COMPANY**

CONSTRUCTION MACHINERY



# CUT 8-GAUGE STEEL with No. 208 STANLEY UNISHEAR

Steel and brass mills, shipyards, heavy sheet fabricating shops, tank shops, railroad shops and others use Stanley No. 208 Unishears on the heavy production jobs as well as in their maintenance and repair divisions.

A one-man portable electric shear that cuts up to 10 feet per minute—makes straight or curved cuts. Easily suspended when job requires it. Maximum capacity 8 gauge (.171" thick) hot rolled steel. Write for complete details. Stanley Electric Tools, Division of The Stanley Works, New Britain, Connecticut.

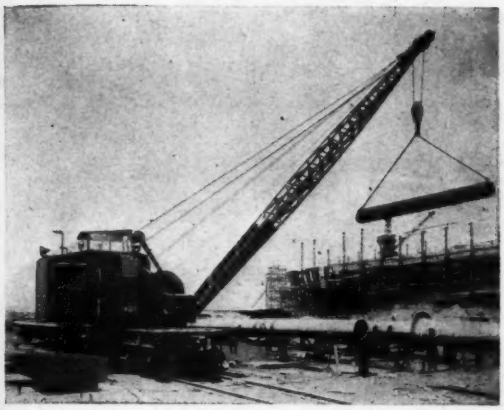
ARMY (E) NAVY

STANLEY
TRADE MARK

## STANLEY UNISHEARS

THE ELECTRICALLY DRIVEN HAND SHEARS

# I·B CRANES HELP SPEED PRODUCTION QUOTAS IN SCORES OF INDUSTRIES



In steel mills and factories, at coal and ore docks, on railroads and in construction operations, I.B. cranes, bridges and car dumpers are reducing costs and speeding up material handling. At left is an I.B. Diesel Locomotive crane known the world over for its long life and low cost operation.

At the right is shown an I.B. 4 Motor Electric Traveling Portal Pier Crane. The 110 foot boom handles 34 tons at 35 feet and 11 tons at 110 feet. For the answer to your material handling problems, get complete facts from I. B.

**INDUSTRIAL BROWNHOIST BUILDS BETTER CRANES**

INDUSTRIAL BROWNHOIST CORP. • BAY CITY, MICH. • District Offices: New York, Philadelphia, Cleveland, Chicago • Agencies: Detroit, Birmingham, Houston, Denver, Los Angeles, San Francisco, Seattle, Vancouver, B.C., Winnipeg, Canadian Brownhoist Ltd., Montreal, Quebec.

# 100% Self Contained

## *SYNTRON*

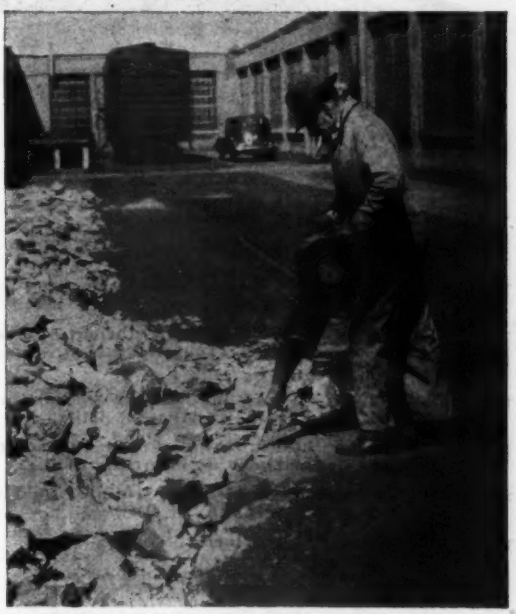
Gasoline Hammer

# PAVING BREAKERS

## Have POWER to Spare—

Breaking Concrete
Breaking Rock
Digging Shale
Spading Clay
Backfill Tamping
Cutting Asphalt
Driving Ground Rods
Driving Spikes

*Literature on request*



Require no air compressor and hose—no battery box and cable—no springs.

**SYNTRON CO., 290 Lexington, Homer City, Pa.**

MODEL 125
½ INCH DRILL

Mall Drills
REG. U.S. PAT. OFF.

Pack Extra Punch and Power...

MODEL 143T
¼ INCH DRILL

**MALLDRILLS pack the wallop that counts in construction or general maintenance work . . .**

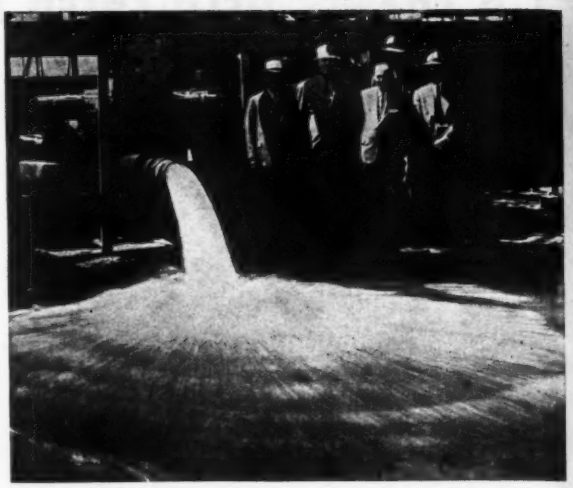
- ★ Rugged construction for long, hard, continuous drilling of metal, plastics and wood.
- ★ Special steel alloy gears and self-lubricating bearings assure increased speed, cool operation, and long service.
- ★ Light weight and compact design reduce worker fatigue. Also add to adaptability of drills.
- ★ Easily serviced—commutator can be inspected and brushes replaced without dismantling drill.
- ★ ¼" and ½" capacity models are available for 110-volt A.C. or D.C. or 220-volt A.C. or D.C.
- ★ Available on suitable priority.

*Ask your Supplier or write for literature and prices*

MALL TOOL COMPANY
7746 South Chicago Ave., Chicago 19, Ill.
*Offices in Principal Cities*

Mall REG. U.S. PAT. OFF. PORTABLE POWER TOOLS





# WATER SYSTEMS
## *For Cities, Towns and Industries*

Practically all of Layne's emergency War Plant Water System construction has been finished. Essential Civilian Industries, Cities, Towns and Villages are next in line. The entire Layne organization is now devoting almost full time to peace-time Water System installation. This means that Industrial, and City Officials—Engineers and Plant Superintendents, can now proceed with their Well Water System development plans.

The natural choice of Well Water Systems and Pumps will be those built by Layne. No other make can possibly provide so many outstanding and thoroughly proven features of sturdy construction, long lasting quality or unmatchable efficiency.

Layne builds Well Water Systems of all sizes to fulfill the needs of the largest industries and cities down to those of the progressive little village. Based on low operating cost, and long life, Layne Well Water Systems are the finest investment an Industry, City, Town or Village can make.

For late catalogs or the services of a Layne Engineer, address Layne & Bowler, Inc., General Offices, Memphis

***LAYNE PUMPS**—fulfill every need for producing large quantities of water at low cost from wells, streams, mines or reservoirs. Send for literature.*

**AFFILIATED COMPANIES:** Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Texas Co., Houston, Texas ★ Layne-Western Co., Kansas City, Mo. ★ Layne-Western Co. of Minnesota, Minneapolis, Minn. ★ International Water Supply Ltd., London, Ontario, Canada ★ Layne-Hispano Americana, S. A., Mexico, D. F.

LAYNE

WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

# A TORRENT WAS *Stopped* INSTANTLY

A large intake pipe under a bay of the Atlantic Ocean developed a series of serious leaks which allowed an average head of 20 feet of water to pour through. Emergency action was necessary and a diver made an unsuccessful attempt to find the leaks from the water side.

Stonhard Company's technical staff was called upon. They used STONHARD STONTITE with Standard Portland Cement to plug the leaks *from the inside of the pipe.*

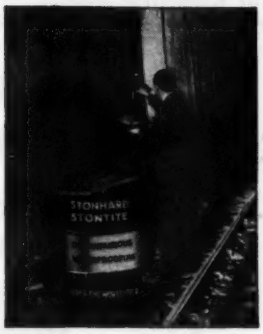
*The torrent was stopped instantly.*

**THIS IS ONLY ONE JOB IN WHICH STONHARD STONTITE'S PERFORMANCE PROVED SUPERIOR . . . *What Stonhard Stontite has done for others, it can do for you.***

NO JOB TOO LARGE OR TOO SMALL FOR

## STONHARD STONTITE

*Stonhard Stontite* will stop leakage, torrent or trickle, permanently against direct water pressure in dams, reservoirs, tunnels, pump wells, elevator pits, scale pits, manholes, basements, floors and walls.




**BONDS PERFECTLY TO OLD AND NEW CONCRETE OR MASONRY**

## STONHARD COMPANY

***Building Maintenance Materials***

***Serving the Railroads, Utilities and Industry Since 1922***

**401 N. BROAD ST., PHILADELPHIA 8, PA.**

Mail this Coupon NOW for more information and FREE folder, "Water Leaks Stopped Instantly." NO OBLIGATION.

**STONHARD COMPANY**
**1323 Callowhill Street**
**Philadelphia 8, Pa.**

**Please send us more information on *Stonhard Stontite* and the folder, "Water Leaks Stopped Instantly."**

FIRM_____
ADDRESS_____
CITY_____ ZONE_____ STATE_____
MR._____ TITLE_____

# PROTECTION AROUND THE CLOCK

## JUSTRITE

*Safety Gasoline Can*

*Oily Waste Can*

### *Ask Your Supplier About Justrite*

He will give you definite reasons why these Safety Cans and Oily Waste Cans are preferred equipment for shops and wherever power equipment is used or stored. These cans are standard equipment with many railroads not only because of their safety features but from a practical standpoint of efficiency and economy. They're approved for safety and so labeled by Underwriters' Laboratories, Inc., and the Associated Factory Mutual Fire Insurance Companies.

*Oily Waste Can*—The safe container for dangerous, oily waste. Top closes automatically. May be had with or without foot lever opener. Ruggedly built of 24-gauge steel. Cut fire and explosion hazards to a minimum.

*Safety Gasoline Can*—For the safe handling and storing of flammable liquids. Body made of heavy lead-coated sheet steel, double seamed and soldered. Swing handle on large sizes . . . small sizes with "trigger" handle. Handy to fill, pour and carry.

### *AVAILABLE SOON!*

**THE NEW JUSTRITE HEADLIGHT LANTERN**

Throws a powerful beam or brilliant floodlight. Adjustable moisture-proof headband. Battery case fits in the pocket or on the belt clip, leaving both hands free.

*Safety Headlight Lantern*

**HANDY-SAFETY FLASHLIGHT**

1500 candlepower 3 cell flashlight. Has all the famous Justrite Safety Features sealed in a sturdy plastic case. Fits the palm of the hand or carried on belt clip. Approved for safety by Underwriters' Laboratories, Inc., and U. S. Bureau of Mines for safe use in methane gas and air mixtures.

*Model No. 17-S Flashlight*

***Ask your Supplier for complete specifications and prices.***

**JUSTRITE MANUFACTURING COMPANY**
**2063 N. Southport Ave., Dept. D-7, Chicago 14, Illinois**

**JUSTRITE** *Safety Products*

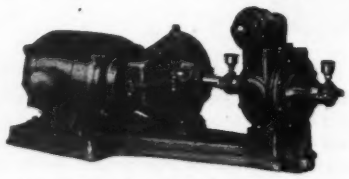
SAFETY CANS · FILLING CANS · OILY WASTE CANS
APPROVED SAFETY ELECTRIC LANTERNS

for Handling **FUEL OIL, LUBE OIL** and Similar Liquids
*Investigate*

# BLACKMER ROTARY PUMPS

**SELF-ADJUSTING FOR WEAR**

"Bucket Design" swinging vanes automatically compensate for wear. When the "buckets" finally wear out, a 20-minute replacement job restores the pump to normal capacity.



Write for Bulletin No. 306—Facts About Rotary Pumps

**BLACKMER PUMP COMPANY**
2140 Century Avenue Grand Rapids 9, Michigan

**REFUELING UNITS FOR DIESEL LOCOMOTIVES**

**POWER PUMPS · HAND PUMPS · EZY-KLEEN STRAINERS**

**WISCONSIN HEAVY-DUTY** *Air-Cooled* **ENGINES** *on the Job*

**MATERIAL HANDLING**

Material handling is a dirty job for both men and machines . . . but it isn't too dirty or too tough for Wisconsin Heavy-Duty Air-Cooled Engines. This Jeffrey Model 209B Portable Scraper Conveyor, powered by a Wisconsin 4-cylinder air-cooled engine, is made by Jeffrey Mfg. Co., Columbus Ohio.

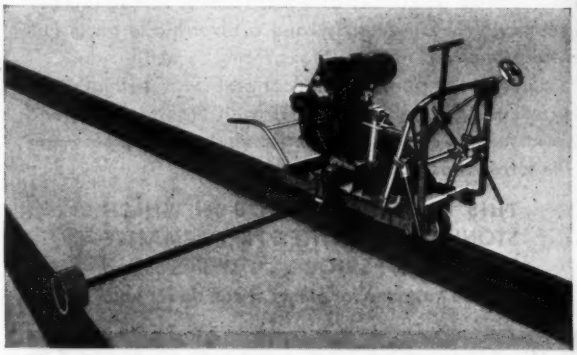
If your equipment requires rugged, dependable power within a range of 1 to 30 hp., you can't do better than to specify "Wisconsin".

Most H.P. per pound **WISCONSIN MOTOR** Corporation
MILWAUKEE 14, WISCONSIN, U. S. A.
*World's Largest Builders of Heavy-Duty Air-Cooled Engines*

## Heavy-Duty, High-Speed Track Grinder

The versatile P-6 Portable Track Grinder is designed for grinding flangeways and removing surplus welding metal from the surface of rail ends, frogs, and crossings. Equipped with a 20-hp. gasoline engine, the P-6 can be raised or lowered or turned from one rail to the other. It has an adjustable derailing device.

Write for our latest bulletins.



The P-6 Portable Track Grinder. One of 15 RTW models.

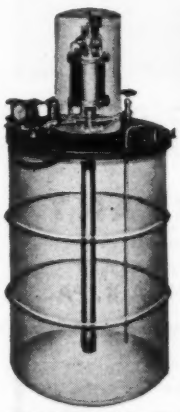
**Railway Trackwork Co.**
3207 Kensington Avenue, Philadelphia 34, Pa.

8009

## Now! Spray Paints, Red Lead, Asphalt, etc.

**. . . with the new Alemite**

**"VERSATAL" PUMP**



**Model 7804-C** for red lead, fibre coatings, other heavier type materials. Also available: Model 7805-C for lighter materials; portable Models 7800 and 7802.

● Here's something entirely new and different for high-pressure spraying! It's the Alemite "Versatal"—a heavy-duty air-operated pump that can reduce labor and material costs up to *50% or more.*

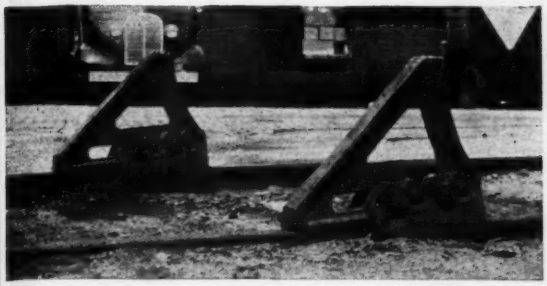
This revolutionary new unit feeds paints, roofing materials, and other heavy or light consistency materials at a uniform rate to as many as six spray heads located several hundred feet away. Can be loaded *without* stopping operations. Automatic agitation keeps materials constantly circulated *without* use of mechanical agitator. Pump is easy to clean.

***Write today for free illustrated catalog!***

**ALEMITE**
*First in Modern Lubrication*
Another Product of STEWART WARNER

*Dept. H6, 1835 Diversey Parkway, Chicago 14, Ill. In Canada: Belleville, Ont.*

# Q AND C CAR STOPS CONSERVE TRACK SPACE



Q and C Car Stops are economical as they require very little track space and are applied with a minimum of labor. They wedge firmly to the rails. No drilling is necessary.

One size is suitable for all tee sections of rail. Shocks are absorbed by the wedge feature.

ORDER NOW FOR EARLY DELIVERY.

Q AND C

## THE Q AND C COMPANY

Chicago New York St. Louis

## Stop Those Leaks With SIKA

*If This Is Your Problem:*

— to seal leaks, in tunnels, culverts and other concrete structures, from the inside against pressure.

— to prevent future seepage.

*Here Is Your Solution:*

— hack or sandblast entire surface and clean thoroughly.

— divert water to enlarged bleeder holes by applying quick-setting mortar to smaller leaks. For trowelling use SIKA No. 4A; for guniting, use Gunite SIKA.

— plug bleeders with extremely fast-setting SIKA No. 2 mortar.

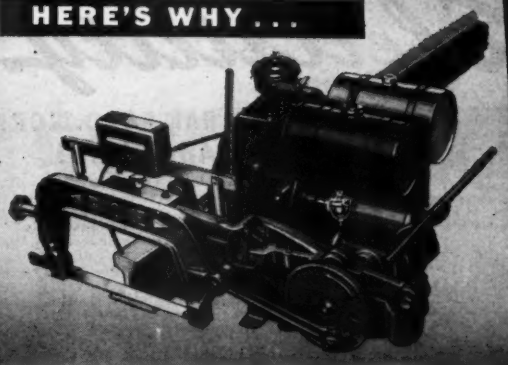
— apply a protective cement coat over entire surface to prevent future leakage. As a water-resisting compound, use SIKA No. 1 for trowel application, or Gunite SIKA for Gunite work.

Waiting for you — a copy of SIKA's condensed catalog, with quick, concise information on these SIKA compounds. Write for your copy today.

Sika
Reg. U. S. Pat. Off.

SIKA CHEMICAL CORPORATION
Gregory Avenue Passaic, N. J.
*Manufacturers of*
Compounds for Concrete Problems • Plastiment, The Concrete Densifier

HERE'S WHY . . .



*Many Railroads Prefer*
# RACINE
*High Speed Portable*
## RAIL SAWS

1 *They cut rails faster than any other method* — An 80 lb. rail in 5 min., 100 lb. rail in 7 min., 130 lb. in 9 min. Standard capacity for rails up to 7⅛" x 6½". Extra capacity 10" x 6½" for special Trilby rails.

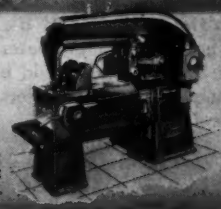
2 *They do a more accurate job* — As little as 3/10" can be cut from end of rail. Cutting results in a smooth rail face that requires no additional work.

3 *They save time and labor* — Two men can easily transport and only one man needed to operate saw. No need for heavy "on track" equipment — no traffic delays because of rail cutting.

4 *They do a better cutting job* — No chipping, overheating or burning of grain structure. No split ends.

Racine Rail Saws are today standard maintenance equipment in the yards and shops of many leading railroads. Models are available for operation with gasoline, electric and compressed air power. Write for descriptive [illegible] for complete details.

**RACINE METAL SAWS FOR SMALL AND LARGE SHOPS**
Investigate Racine's complete line of hydraulic metal cutting saws — with simple one lever control for all operating phases . . . for fast, accurate cutting of any metal. In capacities 6"x6" to 20"x20". Ask for Catalog No. 12. RACINE TOOL AND MACHINE COMPANY, 1738 State St., Racine, Wis.



RACINE
# RACINE

# Electricity

Models range from 250 to 35,000 watts. A. C. types from 115 to 660 volts, 25, 50, 180 cycles, single or three-phase and 400, 500 and 800 cycles, single phase. D. C. types from 6 to 4000 volts. Also available in dual voltage and special frequency types.

Onan

## FOR RAILROAD WORK *Anywhere!*

Onan Electric Generating Plants provide sure, on-the-spot electric power to meet many situations and applications in the Railroad Industry. Indispensable for maintenance work, signal systems, service and general lighting, repair shops, emergencies and other uses.

Driven by Onan-built, 4-cycle gasoline engines, these power plants are of single-unit, compact design and sturdy construction. They are suitable for intermittent or heavy duty, continuous service.

Model shown is from W2C series: 2000 to 3500 watts; powered by Onan-built, two-cylinder, water-cooled engine.

**D. W. ONAN & SONS**

4493 Royalston Ave.
Minneapolis 5, Minn.

*Write For Folder 690-A describing complete Onan Line*



# LUFKIN "METALLIC" WOVEN TAPES

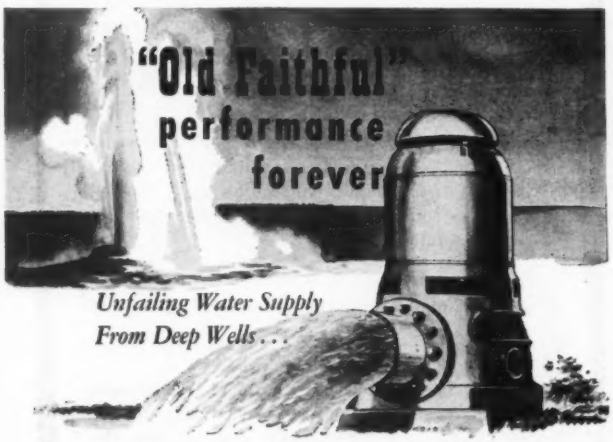
Where steel tape accuracy is not required, the Lufkin "Metallic" Woven Tape is ideal. Coated line with metallic warp gives long wear; resists moisture, stretching and fraying. Large, clear markings make it easy to read. Specify Lufkin and get the best. Write for free catalog.

ARMY E NAVY

**LUFKIN**

SAGINAW, MICHIGAN · NEW YORK CITY
TAPES · RULES · PRECISION TOOLS






**FEATURES**—(Turbine Type)

Water-cooled head bearings • Choice of oil or water lubrication • Double Bearings in each bowl • Fully-enclosed impellers • Double Seal impellers.

ARMY E NAVY
PEERLESS PUMP

Capacities—10 to 220,000 gallons per minute

# PEERLESS PUMPS

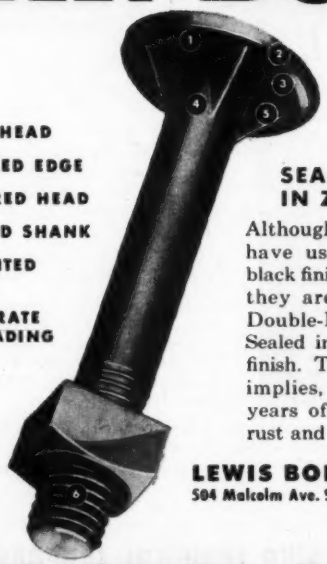
PEERLESS PUMP DIVISION
Food Machinery Corporation

TURBINE
HI-LIFT
HYDRO-FOIL

301 W. Ave. 26, Los Angeles 31, Calif. • 1250 Camden Ave. S.W., Canton 6, Ohio • Other Factories: San Jose 3, Fresno 16, Calif.



# SEALTITE CAR BOLT




1 THIN HEAD
2 BEVELED EDGE
3 TAPERED HEAD
4 ROUND SHANK
5 PATENTED FINS
6 ACCURATE THREADING

**SEALED-TITE IN ZINC BOLTS**

Although many railroads have used thousands of black finished Sealtite bolts they are turning to our Double-Life Hot-Dipped, Sealed in Zinc, galvanized finish. This, as the name implies, does add many years of life by stopping rust and corrosion.

**LEWIS BOLT & NUT CO.**
504 Malcolm Ave. S.E., Minneapolis, Minn.

# DESIGNED TO DO A BETTER JOB

# LOWER
## SHOP POWER COSTS

● Dependable shop power . . . at lower cost . . . is the job Atlas Imperial Diesel engines are doing daily for scores of industries. Ruggedly-built and easily-maintained, these proven diesels are providing the answer of power for driving air compressors, generators, hoists, shovels, and other road and shop equipment.

Atlas Imperials are slow-speed, low-exhaust temperature diesels of simple construction. They can be operated continuously with little attention. And built by a manufacturer who has over forty years of engine construction experience, they mean more power per dollar for Atlas Diesel owners . . . Get all the facts about lower-operating-cost Atlas Imperial Diesels. Atlas power engineers will assist you with your power problems . . . now or for the future. Write today. No obligation.

ATLAS Imperial DIESEL ENGINES

**ATLAS IMPERIAL**
**DIESEL ENGINE CO.**
228 LASALLE STREET, CHICAGO 1, ILLINOIS, ROOM 1211
*Branches in Principal Cities, Canada and Alaska*



*. . . This Track Jack Is Hard To Wear Out!*

Simplex No. 217 Track Jack, 15-tons capacity. Height 22¾". Lift 13". Toe lift 2⅛" from ground level. Weight 60 lbs.

Simplex Track Jacks are built for rugged work and lots of it. They have exclusive *electrided* gibs which assure five times the normal service life of ordinary malleable iron gibs. A hardened steel plate inserted in housing at top of gib section further retards internal wear. Rustproof tension springs assure safe operation at any angle. A few reasons why Simplex Track Jacks are preferred on most right-of-ways.

**Simplex**
LEVER · SCREW · HYDRAULIC
**Jacks**

Templeton, Kenly & Co., Chicago (44), Ill.
*Better, Safer Jacks Since 1899*



# FITZGERALD
SINCE 1906 **GASKETS**
THE COMPLETE LINE THAT COMPLETELY SATISFIES

*for All Railway Purposes*

*Gasket Craftsmen for 39 Years*

Write for information

• • • • •

**The Fitzgerald Manufacturing Company**
Torrington, Conn.

Branches: Chicago, Ill. — Los Angeles, Cal.
Canadian FITZGERALD Limited, Toronto



## HERE'S THE NEW QUICK WAY TO
# FIX BROKEN CONCRETE FLOORS

There's no need to tie up plant traffic while broken concrete floors are being repaired. Durable INSTANT-USE will restore your floors to solid smoothness in a hurry. This new plastic resurfacer is ready for use almost as soon as it's put down. Bonds tight to old concrete, makes long-lasting heavy duty patch. Withstands extreme loads.

**TAMP! TRUCK OVER!**

Simply shovel INSTANT-USE into the hole or rut —tamp—and your floor is ready for traffic without the usual wait for setting. Keep a drum on hand for emergencies. Immediate shipment.

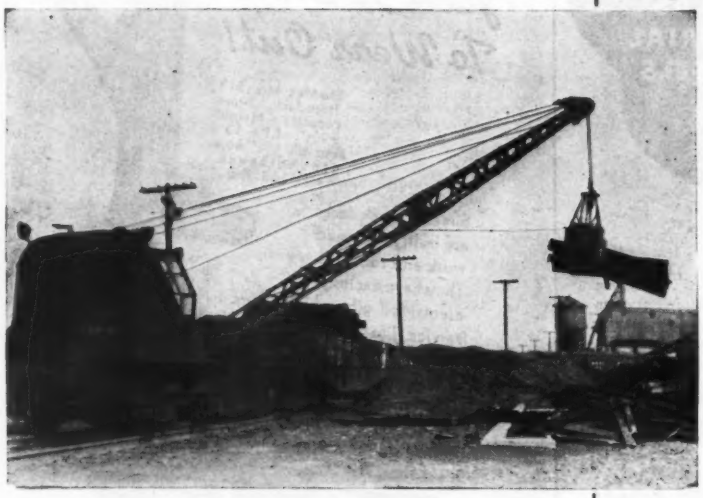
*REQUEST DESCRIPTIVE FOLDER and Details of FREE TRIAL OFFER*

# INSTANT-USE

**FLEXROCK COMPANY**
**3647 Filbert St., Philadelphia 4, Pa.**
Please send me complete INSTANT-USE information and details of FREE TRIAL OFFER—no obligation.

Name .....
Company .....
Address .....

# BURRO CRANES



## "Don't Spare the Burros"

**Your Burro can turn out its quota of day after day track and yard work and an endless number of special jobs too—wherever materials are to be lifted or placed, tracks layed, bridges built, piles driven, ballast spread, or for any of the other types of loading or unloading jobs—the Burro Crane can do it better, cheaper, easier and faster. Here's why:**

- **Travels under its own power. Draw bar pulls up to 7500 lbs. Elevated boom hauls for working over high-sided gondola cars.**
- **Low enough to travel anywhere on a flat car—lifts itself off track and on again in a few minutes—never holds up traffic.**
- **Accessories available include pile drivers, magnets, buckets and drag lines.**
- **For yard work it's tops—small, compact, economical and powerful, truly a Burro for work. Rugged, sturdy in construction, will give years of reliable service.**

## CULLEN-FRIESTEDT COMPANY

**1301 S. KILBOURN AVE. CHICAGO 23, ILL.**

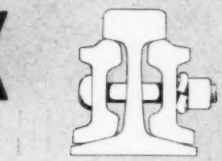
*Write for Bulletin F-115 and F-120*

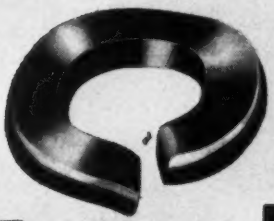

## ALPHABETICAL INDEX TO ADVERTISERS


Air Reduction Sales Co. ..... 550-551
Allis Chalmers Tractor Division ..... 564
American Brake Shoe Co. ..... 570
American Hoist & Derrick Co. ..... 558
American Locker Company, Inc. ..... 540
Armco Railroad Sales Co., Inc. ..... 542
Atlas Imperial Diesel Engine Co. ..... 621
Barco Manufacturing Company ..... 544
Bethlehem Steel Co. ..... 523
Blackmer Pump Company ..... 618
Briggs & Stratton Corp. ..... 562
Buda Co., The ..... 624
Byron Jackson Co. ..... 561
Chain Belt Company ..... 614
Chicago Pneumatic Tool Company ..... 548
Cletrac Division of Oliver ..... 556
Cullen-Friestedt Co. ..... 622
Disston & Sons, Inc., Henry ..... 554
Douglas Fir Plywood Assn. ..... 552
Du Pont de Nemours & Co., Inc., E. I. ..... 560
Dura-Tred Company ..... 613
Eaton Manufacturing Company ..... 522
Electric Tamper & Equipment Co. ..... 565
Fairbanks-Morse & Co. ..... 557
Fairmont Railway Motors, Inc. ..... 568
Fitzgerald Manufacturing Company ..... 621
Flexrock Company ..... 621
Flintkote Company, The ..... 609
Food Machinery Corporation ..... 620
Gorman-Rupp Company, The ..... 524
Haering & Co., Inc., D. W. ..... 612
Harnischfeger Corporation ..... 546
Holyoke Compressor and Air Tool Dept. ..... 541
Homelite Corporation ..... 531
Independent Pneumatic Tool Co. ..... 526
Industrial Brownhoist ..... 615
Jordan Co., O. F. ..... 612
Justrite Manufacturing Company ..... 617
Kinner Motors, Inc. ..... 539
Koppers Company, Inc. ..... 563
Layne & Bowler, Inc. ..... 616
Le Tourneau, Inc., R. G. ..... 553
Lewis Bolt & Nut Co. ..... 620
Link-Belt Speeder Corporation ..... 528
Lufkin Rule Co., The ..... 620
Maintenance Equipment Company ..... 521
Mall Tool Company ..... 616
Master Vibrator Company ..... 613
Metal & Thermit ..... 534
Morrison Metalweld Process, Inc. ..... 530
Morrison Railway Supply Corp. ..... 530
National Lead Company ..... 559
National Lock Washer Company, The ..... 623
Nordberg Mfg. Co. ..... 533
Northwest Engineering Co. ..... 527
Oliver Corporation, The ..... 556
Onan & Sons, D. W. ..... 620
Oxweld Railroad Service Company, The ..... 537
P. & M. Co. ..... 543
Peerless Pump Division ..... 620
Pettibone Mulliken Corp. ..... 547
Pittsburgh Pipe Cleaner Company ..... 529
Q and C Co., The ..... 619
Racine Tool & Machine Co. ..... 619
Rail Joint Company, Inc., The ..... 535
Railway Maintenance Corp. ..... 567
Railway Track-work Co. ..... 618
Ramapo Ajax Division ..... 570
Reliance Division ..... 522
Schramm, Inc. ..... 603
Sika Chemical Corporation ..... 619
Skilsaw, Inc. ..... 562
Sperry Rail Service ..... 549
Stanley Electric Tools ..... 614
Stewart-Warner ..... 618
Stonhard Company ..... 617
Syntron Co. ..... 615
Templeton, Kenly & Co. ..... 621
Thew Shovel Co. ..... 536
Timber Engineering Company, Inc. ..... 538
Timken Roller Bearing Company, The ..... 545
Union Carbide and Carbon Corporation ..... 537
Union Metal Manufacturing Company, The ..... 607
Warren Tool Corporation ..... 525
Weir Kilby Corporation ..... 605
Williams & Co., J. H. ..... 555
Wisconsin Motor Corporation ..... 618
Wood Preserving Division ..... 563
Woodings Forge & Tool Co. ..... 611
Woodings-Verona Tool Works ..... 611
Woolery Machine Company ..... 532
Worthington Pump and Machinery Corporation ..... 541

**IMPROVED HIPOWER SPRING WASHERS**
are a guarantee of safety
and service. They definitely
reduce maintenance costs.

# IMPROVED HIPOWERS
# IMPROVE TRACK





THE NATIONAL LOCK WASHER COMPANY, NEWARK, N. J., U. S. A.
A COMPLETE LINE OF RAILWAY SPRING WASHERS

# THIS . . .

## does the work of

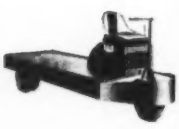
# THESE . . .

## men

The BUDA Track Liner is a "natural" now that help is hard to get—railroad men have found the liner a one man gang itself.

This sturdy tool handles more rail than a gang using 'lining bars, —this leaves extra men available for other jobs.

Send today for illustrated bulletins on the BUDA Track Liner and other money saving, maintenance of way equipment.



BUDA Chore Boy

BUDA "All Purpose" Jacks

# BUDA

**15403 Commercial Avenue**
**HARVEY** (Chicago Suburb) **ILLINOIS**

BUDA Gas, Gasoline and Diesel Engines

BUDA Nozzle Testers